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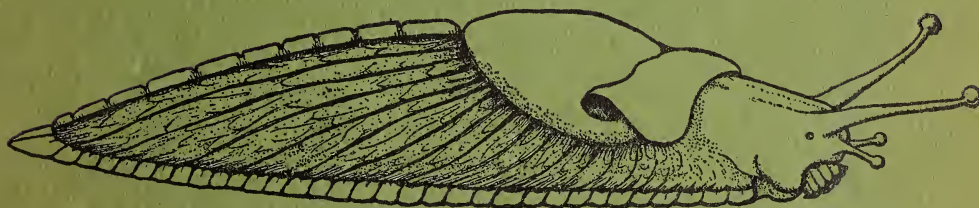
EAST AFRICAN SLUGS  
OF THE FAMILY UROCYCLIDAE

(PARTS III & IV)

THE GENUS TRICHOTOXON

*by*

B. VERDCOURT, PH.D., F.L.S., B.SC. and R. POLHILL, B.A.



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# EAST AFRICAN SLUGS OF THE FAMILY UROCYCLIDAE—PART 3\*

By B. VERDCOURT, Ph.D., F.L.S., B.Sc. and R. POLHILL, B.A.

## TRICHOTOXON

Simroth in Nova Acta Leop.-Carol. 54, 54 (1889); Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 295 (1919)

Rather large to very large slugs with small globular flagellum and a tubular lime gland; dart sac usually very large with thick muscular walls containing calcareous darts which are often very long (save in the subgenus *Atrichotoxon*).

Genotype, *T. heynemanni* Simroth

## SOME INTRODUCTORY NOTES

In tropical regions the problems of specific differentiation are often much more difficult than, for example, in Britain; this is not merely due to the great difference in the amount of work which has been carried out in the latter country. Species do appear to grade into each other in some tropical groups and the more material one examines the more confused does the situation become. When a little material is available from a small area one finds that several distinctive forms appear to be recognisable but when an abundance of material is available from a much wider area these distinctions often break down.

At present in this family of slugs, we are describing but sometimes not naming the various varieties which have come to hand, until there is a better understanding of what constitutes true specific characters. Several warnings are necessary to would-be describers of slugs who have not seen populations of these animals in the field. Colour variation is spectacular in some areas, e.g. in slugs on Mt. Kulal and in the Nyambeni Hills (both in Kenya) there is amazing variation in the colour scheme but there is a certain basic underlying pattern which is only evident to a field worker, e.g. in one area a slug may vary from greenish-yellow to bright salmon and yellow or be greenish with big spots all over it but the head is always greenish-yellow and the fringe reddish-salmon; in other areas another range of colour variation may be found in another variant but the fringe is always purple and one receives the impression that these two populations are clearly distinguishable by certain basic colour patterns. In other areas, however, species are uniform in colour.

This genetic stability or instability in the matter of colour has been used as a subspecific character even where other morphological characters are obscure. Apart from these intrinsic difficulties there are some practical ones. Examination of the darts to see if they have the crystals produced (i.e. are hairy) should be done under water, in which case the hairs spring out; examined dry or in certain mounting media the hairs are closely adpressed and appear to present merely a roughening of the dart surface. We have made this error ourselves and it is so easy to do that not too much notice should be taken of old descriptions, although Simroth undoubtedly was aware of this difficulty. The shape of the dart sac, degree of bilobing at the apex and size of the darts varies as the slug reaches maturity. A previously unknown fact is that there are darts present in the dart sacs of quite juvenile slugs; as the sac grows so do the darts. Another fact which must be borne in mind before too much emphasis is placed on some morphological characters one has discovered, is that there are often distinct phases, where first the female ducts and then the male ducts are relatively undeveloped, e.g. the fact that one finds an albumen gland in one individual four times as large as that in another may be of no value whatsoever as a character. The relative positions of various twists and loops of the ducts *in situ* also vary a good deal—it is easy to imagine that these are going to vary and get orientated in slightly different ways as different individuals mature.

The well-marked subgenera may be separated by a key similar to that given by Pilsbry:—

- |  |                           |
|--|---------------------------|
| 1. Oviduct entering at or near the apex (distal end) of the combined atrium and dart sac . . . . . | 2                         |
| 1. Oviduct entering at middle or base (proximal end) of combined atrium and dart sac . . . . .     | 3                         |
| 2. Four to six darts in pairs (14 in <i>T. robustum</i> ) . . . . .                                | subg. <i>Trichotoxon</i>  |
| 2. No darts . . . . .  | subg. <i>Atrichotoxon</i> |
| 3. Eight† or more slender needle-like darts . . . . .  | subg. <i>Polytoxon</i>    |
| 3. One spiral dart . . . . .   | subg. <i>Spirotoxon</i>   |

The subgenera of *Trichotoxon* are to my mind considerably more distinct than the group of genera related to *Urocyclus* but I have hesitated to raise them to full generic rank.

Subgenus *Trichotoxon sensu stricto*

Subgenus *Diplotoxon* Simroth in Reise in Ostafrika A. Voeltzkow 1903–5, Wiss. Ergebn. 2, 593

\* Continued from *Journ. E. Afr. Nat. Hist. Soc.* 23, 240 (1960).

† Said to be two only in *T. roccatii* Pollon.



(1910) and in S.B. naturf. Ges. Lpz. (1895-6), 149-150 (1897). Subgenotype, *T. heyneimanni* Simroth. Subgenus *Dendrotoxon* Pollonera in Ann. Mag. Nat. Hist. (8), 8, 332 (1911)

This was proposed for *T. kemp* Pollon., *T. prestoni* Pollon. and *T. keniensis* Pollon. and no subgenotype was chosen. I hereby choose *T. keniensis* since that species does have an anatomy rather different from *Trichotoxon sensu stricto* and the name will therefore be available if necessary.

Subgenus *Trichotoxon* is characterised by the strong muscular dart sac combined with the atrium, with the oviduct entering at the distal end. The species are usually very large. Pollonera defines his *Dendrotoxon* by saying that on the upper extremity of the epiphallus there is a true but very small flagellum instead of a calcareous gland.

### Key to the species

1. Penis entering base of dart sac; spermatheca and oviduct entering at apex . . . . . 2
1. Penis spermatheca and oviduct all entering at the apex of the dart sac . . . . . *T. robustum*  
(Simroth does not make the anatomy of *T. neumanni* and *T. athrix* clear—from the simple Latin diagnoses where he says “*praecedente* (i.e. *robustum*) *similis*” one might conclude that they were both similar to *robustum* but the number of darts he mentions indicates that they should be referred to the subgenus *Polytoxon*)
2. Vagina with globose swelling below the junction of the oviduct and spermathecal duct; dart sac containing three pairs of darts; body with glaring white spots of secretion. (Usambaras) . . . . . *T. martensi*
2. Vagina tubular, absent or adnate to the dart sac; in the last case often swollen but other characters not as above . . . . . 3
3. Mantle with marked longitudinal raised rugae giving a corrugated appearance. Body white or grey-ochraceous, or greenish-yellowish-white, a few of the grooves of the hind body black. Dart sac-atrium 2.5-3 cm. long, acutely bifid at apex; base of oviduct swollen, vagina adnate to sac. (Usambaras and Teita area) . . . . . *T. heyneimanni*  
(See text for discussion of *T. conradi*)
3. Mantle reticulate or if rugose other characters not as above . . . . . 4
4. Mantle “sulcate and rugose”, tops of rugae calcareous white; body brownish covered with blackish-grey large spots and minute white spots of calcareous secretion. Dart sac-atrium swollen just above the base and below the apex, bilobed but lobes blunt and not diverging, about 23 mm. long in total length. (Aberdares) . . . . . *T. kemp*  
(N.B. The specimen I have identified with this has very hairy darts)
4. If body spotted then without spots of white secretion . . . . . 5
5. Vagina or bases of oviduct and spermathecal duct leaving middle of truncate apex of atrium-dart sac . . . . . 6
5. Vagina adnate to one side of the bifid apex of the atrium-dart sac . . . . . 7
6. A greenish-brown slug with purple fringe; rain forest of E. Usambaras (3,000 ft.) . . . . . *T. sp.*
6. A greenish-ochre coloured slug covered, when adult, with a mottling of small white irregular spots; bamboo forests of Kenya highlands (c. 10,000 ft.) . . . . . *T. bambuseti*
7. Dart sac-atrium about 3 cm. long, deeply bifid at apex with divergent, sharply pointed lobes; vagina apparently entering about 1 cm. below the points of the lobes (mantle said to be rugose) . . . . . *T. prestoni*
7. Dart sac not so sharply bifid at apex nor vagina situated so far below the apex . . . . . 8
8. Body grey-buff with clusters of obscure bluish spots and a few large white spots; dart sac large, bulbously enlarged at the base, sharply narrowed above, vagina adnate to apex. (Zanzibar, Pemba Island) (dart sac appears to be just over 3 cm. long) . . . . . *T. voeltzkowi*
8. Mainland slugs without above characters combined . . . . . 9
9. Dart sac rather swollen below, bluntly bifid at apex; vagina adnate, oviduct swollen at the base. Darts about 1 cm. long. (Uganda, Sese Islands) . . . . . *T. maculatum*
9. Dart sac more cylindrical, bluntly bifid or quite truncate at the apex, vagina adnate, oviduct scarcely swollen at base. Darts (adult) much longer. Mantle finely reticulate. (Kenya) . . . . . 10
10. Dart sac-atrium 2.1-4 cm. long with correspondingly longer darts. Body whitish or yellowish, head greenish, back often deeply suffused with purple or salmon-red, fringe always purple or salmon-red. (Kenya, Nyambeni-Meru area) . . . . . *T. nyambenense*  
(with subsp. *violaceum*)
10. Dart sac-atrium smaller, even in large adults only 2.2 cm. long, often only 1 cm. long. Body ochraceous, occasionally with a purple fringe . . . . . 11
11. Spermatheca more globose with shorter duct; dart sac more swollen above the base, truncate to vaguely bilobed at apex, penis thicker. (Kenya, Nairobi, Thika, Katamayu areas) . . . . . *T. thikense*
11. Spermatheca more ovoid with longer duct, dart sac cylindrical, not swollen, truncate at

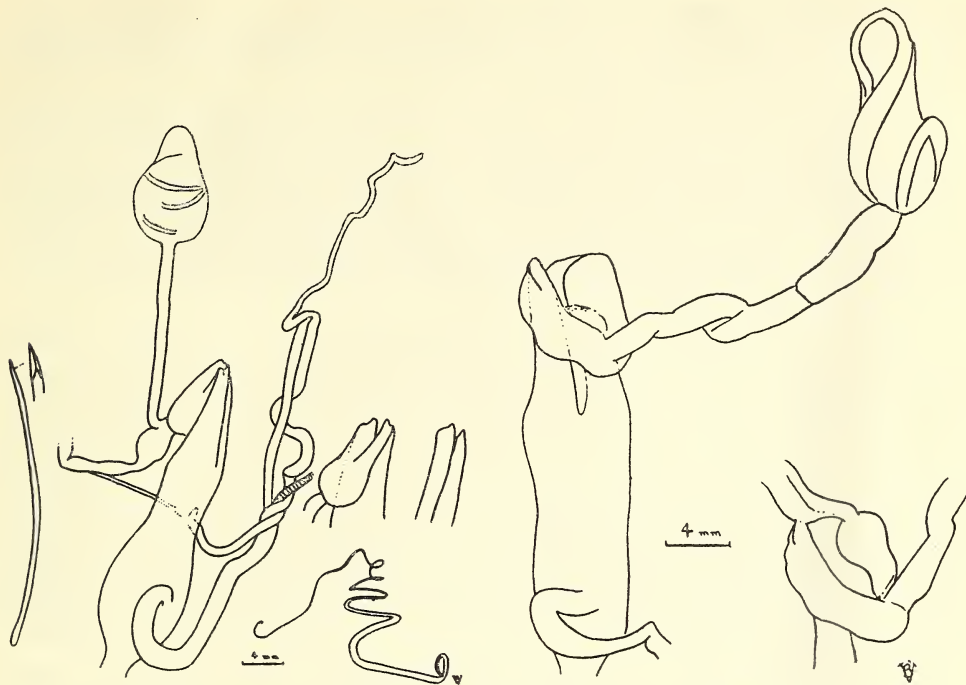


Fig. 8b

Fig. 9

apex; penis slender. (Kenya, Mt. Kenya, 9–10,000 ft.) (Not identified with any recent collections—perhaps not adult and juvenile of some other species; the dart sac appears to be about 14 mm. long and the darts about 9 mm. long) . . . . . *T. kenienne*

*T. heyneimanni* Simroth in Nova Acta Leop.-Carol. 54, 54, t.3, f.6, 8 and 10–13 (1889) and in Abh. Senck. naturf. Ges. 18, 303, t.1, f.5 and 6 (1894) and in Sitzb. Nat. Ges. Lpz. (1895–6), 149 (1897) and in Die Nacktschnecken Ost-Afrikas 6 (1897). Heyneimann mentioned this species without name in Nachrbl. d. deutsch malak. Ges. 1882, 183

A dark olive-green or brownish slug 6.4–6.7 cm. long (orig. descr.). Simroth in the 1894 reference gives a long description and a coloured figure of a specimen from the East Usambaras; this shows a brownish-ochraceous or whitish-brown slug with a very corrugated mantle and some black marks in the grooves on the sides of the hind body. Dart sac broad just above the base, rather abruptly narrowing above, pointed at the apex; base of the oviduct swollen just above the point where it joins the spermathecal duct; vagina tubular, very distinct. There are two pairs of darts which are described as hairy.

KENYA. Witu, leg. Fischer; Teita, leg. Hildebrandt (chosen as type locality).

TANGANYIKA. Magila, leg. Kretschmer; Derema in East Usambaras. In the last reference mentioned above Simroth also gives the locality “between Hemkole and Msassa”, but see next species.

I have not seen any material from the type locality but the very abundant whitish slug found at Amani and elsewhere in the East Usambaras is this species. The coloured figure given by Simroth (1894) is closely matched by this slug which I have studied in some detail. A description is given below, from life.

Slug up to 15 cm. long or even longer, with a strong keel all the way along the back; mantle longitudinally rugose, very sinuate behind, fringe and mantle pale yellowish, body greyish-greenish-white, sometimes without any markings but usually with blackish reticulated blotches on the body and mantle. These markings are very variable. Head and tentacles pale brownish. Sole pale yellowish with grey central area. Mantle 3.7–4.3 cm. long when animal is outstretched, pulmonary orifice large, about 5 mm. in diameter, just behind the middle of the mantle.

A preserved specimen naturally looks different and the specimen from which the dissection



figured in Fig. 8b was made may be described as follows. Animal 9 cm. long and 2 cm. wide; 2.3 cm. high just behind the mantle. Mantle 3.5 cm. long and 3 cm. wide, pulmonary orifice 2 cm. from posterior margin which is distinctly sinuate. The prominent keel on the back and long ridges on the mantle are as distinctive as they are in life.

The preserved animal is grey-brown or putty-coloured with a few dark lines in the grooves on the sides just behind and below the mantle. The anatomy is similar to Simroth's description, save that the oviduct is not so distinctly swollen as he figures, nor is the vagina separate but adnate. The dart sac is about 2.5–3 cm. long, bifid at the apex with two acute points. The darts are huge in two sacs, each containing two; they are 2.8 cm. long and 0.7 mm. in diameter, the end is sharply pointed, they are granulated when examined microscopically and under high powers ( $\times 40$ ) are distinctly hairy. The spermatheca is ovoid, 11 mm. long and 7 mm. wide, the duct about 2 cm. long; the sac contained two spermatophores with traces of a third; these are massive coils about 7.5–8 cm. long when outstretched. The hermaphrodite gland is oval,  $12.5 \times 6.5$  mm. and the hermaphrodite duct is over 5 cm. long. The albumen gland is  $16 \times 7$ –9.5 mm. The uterus is about three times as long as the albumen gland, much convoluted. (Fig. 8b.)

Another specimen collected at Amani in December 1956 (B. Verdcourt) was dissected. This was about 9 cm. long, the mantle 3.1 cm. long and 2 cm. wide in life (3.5 cm. when spread out flat). The posterior margin of the mantle is strongly sinuate with a central rounded portion projecting backwards; the mantle is covered with strong vertical rugulae and there are also cross-ridges. The pallial slit is almost imperceptible; the pulmonary orifice is situated 1.6 cm. from the anterior mantle margin. The animal is uniformly ochraceous save for a very few black marks in the grooves between the rugae on the sides of the hind body. The keel is strong throughout its length. The sole areas are 6.5, 5.25 and 6.5 mm. wide respectively. The dart sac was 2.7 cm. long and 6.1 mm. wide, cylindrical, not very swollen at the base, bifid at the apex, the lobes being rather pointed. These lobes obviously become more pointed as the dart sac develops. (Fig. 9.) The radula examined was 8.5 mm. long and 4.5 mm. wide. There are about 106 teeth in each row on either side of the central tooth; the laterals number about 40 followed by some ten transitional teeth. The outermost 15 marginals are irregular in shape; the next 23–32 have a small cusplet on the outer edge of the main cusp; farther towards the middle the marginals have a faint cusplet on the inside of the main cusp. The average width of the long narrow cusp of the marginal teeth is  $7.5$ – $9 \mu$ . The jaw was bent in the specimen examined, 4.3 mm. wide and 2.8 mm. long.

A similar specimen was also dissected. In this the dart sac was 2.4 cm. long and only bluntly bifid at the apex, the contained darts being about 2.5 cm. long. The pointed ends may only show when the darts are at their maximum development. The spermatheca was 7 mm. long and 6 mm. wide, the duct about 2.3 cm. long.

A pale greenish-yellow juvenile slug with yellow fringe, lighter longitudinal wrinkles on the mantle and similar black markings to adult *T. heyneimanni* was collected as follows. I am certain it is a juvenile of the same form that occurs at Amani. Dr. Urban has confirmed that it belongs to *Trichotoxon sensu stricto*.

TANGANYIKA. Pangani District, Tongwe Mountain, 1950, leg. B. Verdcourt (serial letter CH).

*T. conradti* Simroth in Abh. Senck. naturf. Ges. 18, 305 (1894) and in Die Nacktschnecken Ost-Afrikas 6 footnote (1897) and in Reise in Ostafrika 1903–5, A. Voeltzkow, Wiss. Ergebn. 2, 605, t.26, f.5 (1910)

This species has been very poorly defined and is perhaps no more than a form of the last species. In the original reference it is defined as '*Trichotoxon conradti*' and Simroth says that he would be inclined to separate it from *T. heyneimanni* on account of the shape of the darts and because of the bands on the mantle. In the 1897 reference Simroth states that the darts lack hairs, also that the type specimen was not fully developed and the differences in the darts might be juvenile characters. The figure given in the 1910 reference is exceedingly similar to the figure Simroth gave of *T. heyneimanni*. It shows a slug 6.1 cm. long and 2 cm. high, white (pale flesh or leather-coloured according to the text), with a few of the oblique bands between the rugosities of the back black; there are some marks on the mantle also. As I mentioned the common white slug in the Usambaras is variable in this character.

The type locality is given as "between Hemkole and Msassa" and it was originally found by L. Conradt. Heyneimann (1906) gives the locality as "Burg bei Magila bei Pangani" and Kobelt also gives Magila as a locality. Magila is in the foothills of the East Usambaras and nowhere near Pangani which is on the coast. Pilsbry (1919) states that Hemkole is in the Western Province of Tanganyika but I have elicited the information from various Washambaa that there was a village of Hemkole near Bulwa and another called Msassa near Derema in the East Usambaras; moreover, Conradt, so far as I know, did not collect in any other part of Tanganyika.

*T. voeltzkowi* Simroth in Reise in Ostafrika A. Voeltzkow 1903–5, Wiss. Ergebn. 2, 593, t.26, f.3 and 4, t.f.4 (1910)

Young animal buff with small brown spots and a white dorsal keel. Adult with body grey-buff,

mottled with clusters of obscure bluish spots and a very few large black spots; mantle buff, mottled with brown with a few dark spots on the obscure lateral bands. Fringe and keel darkish. Length of adult animal 6.6 cm. Dart sac bulbously enlarged at the base, sharply narrowed above; two pairs of hairy darts. Vagina adnate to the top of the dart sac; base of the oviduct a little swollen.

ZANZIBAR. Pemba Island, leg. Voeltzkow.

*T. maculatum* Simroth in Die Nacktschnecken Ost-Afrikas 6, t.f.1 (1897) and in Rev. Suisse Zool. 20, 37, t.3, f.4 A-E (1912); Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 297, pl. 8, f.9 (1919). This is the "*T. heyneimanni* Simroth oder eine nahe verwandte art" mentioned by Simroth in Sitz. Ber. Naturf. Ges. Lpz. 19-21 (1892-94), 53 (1895).

Slug about 6 cm. long, pale buff or grey-brown with or without scattered large blackish spots. Dart sac bifid at the apex, ends bluntish, darts about 1 cm. long. Vagina apparently nil, the ducts entering at the extreme apex of the dart sac. Oviduct swelling small.

UGANDA. Sese Islands, leg. Stuhlmann (type locality); Busu, leg. Carl.

Pilsbry stated that the genitalia of this species had not been described or figured but this is a slip since he mentions the very reference containing both a description and figure a few lines above this statement. Pilsbry described a race *perforatum* from Rutshuru which has a pore penetrating the mantle to the shell; the typical race is said to lack it.

*T. prestoni* Pollonera in Ann. Mag. Nat. Hist. (8), 8, 332, pl. 8, f.8-11 (1911)

Body unicolorous, leather-coloured. Mantle longitudinally rugose, pallial aperture very narrow, pulmonary aperture scarcely antemedian. Back rugose, strongly carinate throughout its length, with profound lateral sulcae. Sole unicolorous, median zone granular, lateral zones transversely sulcate. Dorsum 3.4 cm., mantle 2.6 cm. and sole 7.2 cm. long. Dart sac cylindrical, slightly swollen below, bifid apically with pointed divergent lobes. Vagina apparently nil (but it might have been adnate) entering well below the apex of the dart sac; oviduct tubular not swollen. Pollonera stated that he observed five darts.

KENYA. Between the Igembi Hills and Nyeri, leg. R. Kemp.

*T. kempi* Pollonera in Ann. Mag. Nat. Hist. (8), 8, 332, pl. 8, f.5-7 (1911)

Mantle profoundly sulcate and rugose, brownish-fuscos with the tops of the rugae off-white, pulmonary aperture distinctly antemedian, pallial aperture narrow but distinct. Back obtusely but strongly carinate, granulose, sides obliquely sulcate; earth-coloured, covered with blackish-grey evanescent large round spots and minute white spots. Fringe transversely sulcate and minutely white punctate. Sole smooth unicolorous, outer areas slightly transversely sulcate. The white spots on the mantle and the small white spots on the body are made up of a calcareous secretion such as is found in some species of *Dendrolimax*. Dorsum 3.5 cm., mantle 2.2 cm. and sole 6.2 cm. long. Dart sac cylindrical with a rounded bulge just above the base, and another below the apex; apex narrowed and bifid, lobes blunt and not diverging; vagina apparently nil (but might possibly be adnate and unseparated by Pollonera in his dissection); oviduct cylindrical. Pollonera states that there are four extraordinarily long darts.

KENYA. Between the Igembi Hills and Nyeri, leg. R. Kemp.

Mr. R. Polhill has recently discovered a slug which agrees in many ways with Pollonera's description and may well be conspecific. His description and figure are appended.

Body sordid white to biscuit-coloured, speckled dark brown and livid white. Mantle same colour, but extensive brown blotches above. Head and neck white-flecked. Upper tentacles brown. Fringe white of many  $\pm$  fused dots. Sole opaque, white-grey, white-flecked. Body 5 cm. long in spirit, mantle 1.8 cm. long, bluntly pointed anteriorly, very slightly trilobed posteriorly; pallial orifice 1 mm. from posterior end. Scarcely any solid caudal region; and 2 mm. caudal gland starts 4 mm. from posterior tip. Body slightly keeled. Shell  $7 \times 5.5$  mm., very thin, raised part of nucleus small and not very elevated, but opaque area extends 2.5 mm. from posterior end; concentrically striate. Jaw characteristic of group, crescent-shaped with a median lobe on inner side, but this is not very strongly developed. Genitalia: atrium-dart sac 20 mm. long, cylindrical, a little swollen proximally and distally, the dart sacs forming two conspicuous lobes. Two pairs of darts, 20 mm. long, slightly curved, blade triangular, the point formed by two sides only, the third not angled. Blade c. 1 mm. long, haft rounded, hairy, with a few small callouses. Spermatheca,  $7 \times 6$  mm., ovate, pointed distally, duct 11 mm. long. Penis 10 mm. long, L-shaped, joining atrium 4 mm. from aperture, on right-hand side, whence it passes across to left-hand side and back parallel to atrium. Epiphallus c. 11 mm. long in convoluted state, running forward parallel to right-hand side of penis; lime gland c. 20 mm. long. Vas deferens passes forward on left-hand side of penis then twists underneath dart sac; a small flagellum is formed at this



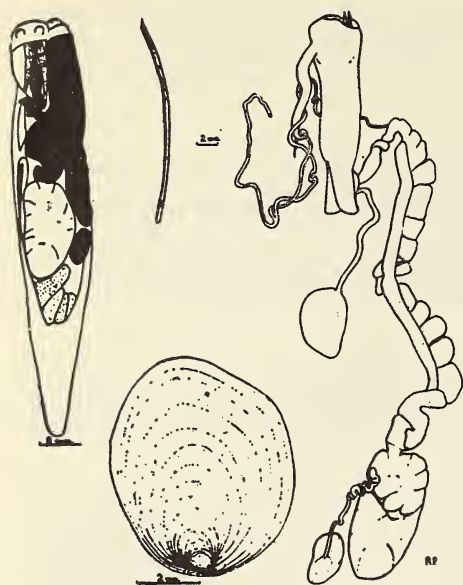


Fig. 10

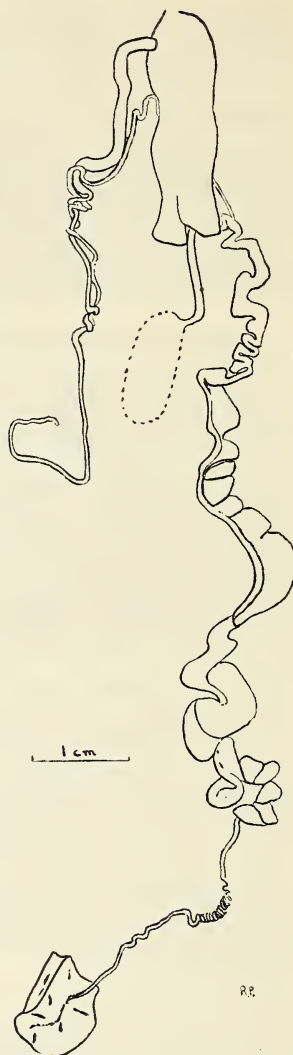


Fig. 11



Fig. 12



point. Oviduct leaves from a ventral cleft between dart sacs, about 3 mm. from their tips. Short duct (4 mm. long) suddenly narrows for 2 mm. before junction with vas deferens. Middle region, c. 30 mm. long, is in the form of a hairpin, looping back and then forward on left-hand side of body, then curves sharply back to form a short, much convoluted distal region. Albumen gland elongate, shield-shaped,  $14 \times 8$  mm. Hermaphrodite gland,  $6 \times 4$  mm., ovate-oblong, duct short (10 mm. long, in convoluted shape). (Fig. 10.)

KENYA. Kiambu District, Katamayu Forest, riverine forest, 8,000 ft., 22 May, 1960, leg. R. Polhill 70.

*T. keniense* Pollonera in Ann. Mag. Nat. Hist. (8), 8, 333, pl. 8, f.3-4 (1911)

Body golden-ochraceous, unspotted, paler ochraceous anteriorly. Mantle granular, not furrowed, pale orange-ochre, pulmonary aperture distinctly postmedian, pallial aperture narrow. Dorsal surface orange-ochre, paler behind, obtusely carinate and ruguloso-granulose, the oblique lateral sulcae only a little impressed. Sole with middle area pale, lateral areas pale brown, transversely sulcate. Dorsum 1.7 cm., mantle 1.3 cm. and sole 5 cm. long. Dart sac cylindrical, truncate at the apex, containing four slightly clavate darts; oviduct and vagina tubular; spermatheca ovoid.

KENYA. Mt. Kenya, 9-10,000 ft., leg. R. Kemp.

*T. thikense* Verdcourt in Rev. Zool. Bot. Afric. 45, 57, t.f.1-3 (1951)

Back and mantle pale grey-buff, grey-brown or brownish-orange. Back strongly keeled, keel becoming obscure just behind the mantle. Pulmonary aperture just over one third of the length of the mantle from its posterior margin, pallial pore barely visible. Tentacles and upper part of the head translucent brown; fringe white or dull purple. Sole white, tinged grey, the middle area pale grey. The sides of the body are reticulated and sulcate but the grooves are not marked with any colour. Body 6.5-9.5 cm. long (alive and outstretched) and 1.3 cm. wide; mantle 3.5-4.5 cm. long. Dart sac cylindrical, 2.2 cm. long and 0.45 cm. wide, swollen above the base to 0.6 cm. wide, truncate at the apex; darts 2.5 cm. long (in this genus the darts protrude into the lower atrium and are therefore longer than the sac). Spermatheca globular with rather a short thick duct.

KENYA. Thika, Chania Falls Gorge, on walls of the gorge and also on the leaves of shrubs (e.g. *Trichocladus ellipticus*) near the water, leg. B. Verdcourt (holotype in Congo Museum, Tervuren), other material in the Coryndon Museum, Nairobi, and the Zoological Museum, Berlin.

The figure of the anatomy given in Fig. 11 was drawn by R. Polhill from topotypic material collected by W. Wilkinson (18 March, 1960). His description of the actual specimen used follows: Body 10 cm. long, smooth, only faintly lined, keeled. The dart sac is very long (2.5 cm.) and markedly cylindrical; darts curved. The penis curves right over and enters low down on right-hand side. The oviduct leaves the sac distally, curling dorsally between dart sacs and then anti-clockwise, forming middle oviduct on right-hand side, this region being much longer relatively than in the following varieties, proceeding a short way (1 cm.) posteriorly, then taking a hairpin bend forward for 2 cm., crossing over atrium-dart sac and then backwards, forming distal oviduct in 6 mm. This last region is very convoluted, 1 cm. long in the natural state. The arrangement illustrated by Verdcourt *loc. cit.* p. 58, Fig. 1.A, is rather different, explicable by a slight variation in the growth direction of the various organs, but the length of the middle oviduct is still characteristic. The spermatheca is a very thin-walled sac, c.  $12 \times 7$  mm., containing spermatophores; the duct 1 cm. long.

I have not seen any authentic material of *T. keniense* but this present species must be very close to it. *T. thikense* comes from a much lower altitude, the spermatheca is more globose with a shorter duct, the dart sac is much more swollen above the base and then suddenly contracted; the penis also appears to be much thicker. More material from Mt. Kenya is needed for comparison. These differences may not be so great as they sound.

Some observations have been made on the development of *T. thikense* and these are very important since they show that no reliance can be placed on the lengths of the darts. Relatively undeveloped slugs from the type locality found associated with typical adults have small dart sacs which actually contain small darts. As the dart sac grows larger so do the darts increase in size. I have no doubt about this, having dissected a range of individuals of various sizes all from the same colony at Thika. Mr. R. Polhill has also confirmed my findings by further dissections. A small specimen, 5.3 cm. long, had undeveloped genitalia and yet small darts were present; the sac was 7.5 mm. long and the darts were 6.3 mm. long with the apical half dilated, somewhat triangular in section, with a sharp cutting edge. A rather larger slug but by no means fully grown had a dart sac 13 mm. long and much more like the adult shape. Some figures of these juvenile dart sacs are given in Fig. 12.

Several other slugs from the vicinity of Nairobi have been examined which are undoubtedly closely allied to the last two species. They are believed to be varieties or growth forms of *T. thikense*

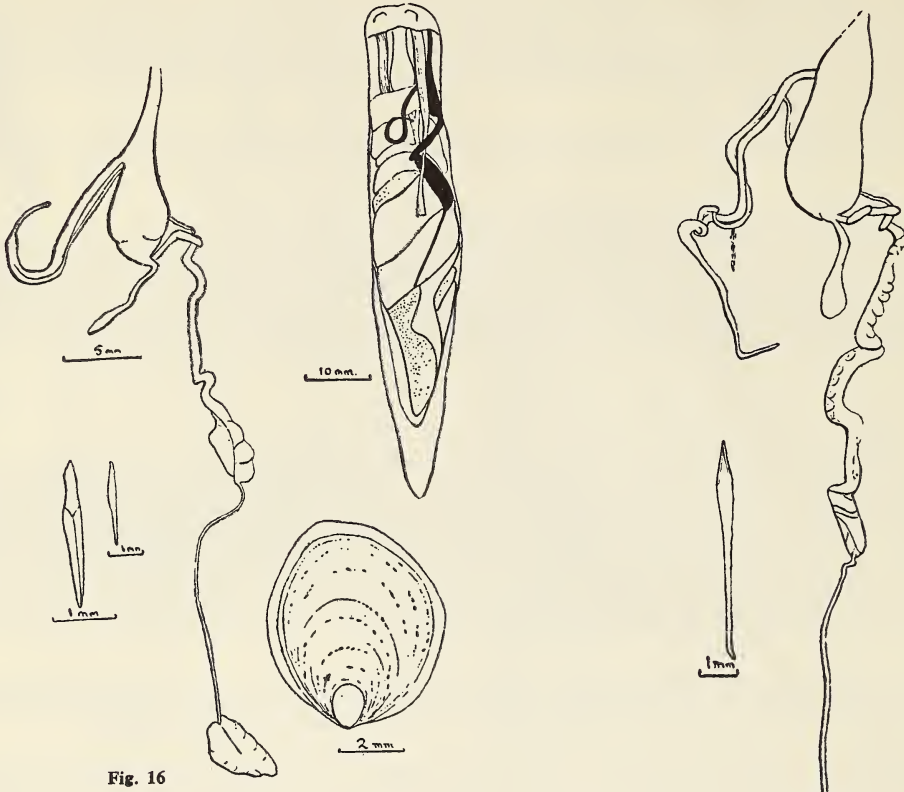


Fig. 13

Fig. 14

Fig. 15

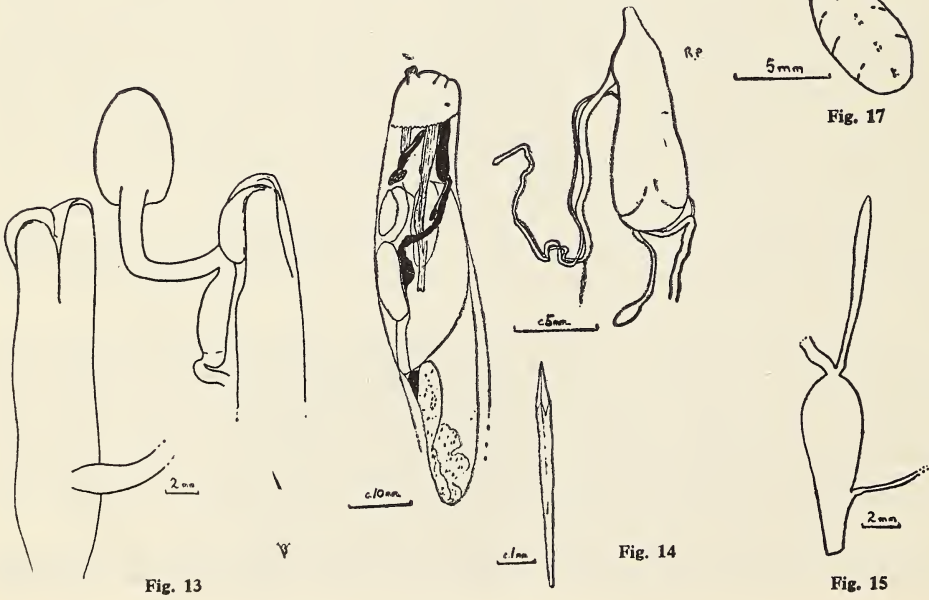


Fig. 16

Fig. 17

Fig. 18



but abundant adult material is needed. It is possible that *keniense*, *thikense* and the slugs mentioned below are conspecific, or perhaps altitudinal races of one species.

***T. thikense* Verdcourt var.\***

A creamy-white slug with a rich purple fringe (in life). Mantle rather smooth, pallial pore minute, pulmonary aperture situated about the middle of the mantle, 1.5 cm. from the posterior edge. Hind body keeled particularly at the rear. The animal is 6.8 cm. long and the mantle is 3.2 cm. long. The genitalia appear to be adult. The dart sac is cylindrical, bifid at the apex with parallel lobes which are blunt. The vagina is adnate and the oviduct is not swollen at the base. Part of the genitalia are shown in Fig. 13.

KENYA. Uplands, Katamayu Forest, leg. J. G. Williams.

A further specimen collected in the same locality by Mr. R. Polhill is clearly conspecific but although larger the genitalia are less developed. Mr. Polhill's description follows and his figures are reproduced in Fig. 14.

Body 7 cm. long in spirit, mantle 3 cm. long, body finely grooved except in caudal region, distinctly keeled. Body very pale yellowish-green, with pink-buff keel and mantle. Head and tentacles dark sepia. Fringe and most of sole purple, but with a whitish band, c. 1/3 of total width, down centre. Shell  $7.5 \times 6$  mm., nucleus raised, rest very thin, membranous, asymmetrical, the apex lying to the left of a line bisecting the nucleus, and the curve of the margin more gradual on the right-hand side; concentrically striate. Atrium-dart sac 12 mm. long, proximal 2.5 mm. narrow, rest sub-cylindrical, broadening slightly to base of the dart sacs, where 3.5 mm. in diameter. Two pairs of darts; darts 7.5 mm. long, straight; blade approximately triangular, 1.8 mm. long; haft slightly angled in proximal part. Spermatheca  $2 \times 1$  mm., oblong, the duct 6 mm. long. The penis enters the atrium-dart sac on the left-hand side anteriorly, just before the sac narrows, it is 11 mm. long; vas deferens running parallel to penis; epiphallus coiled, above 6 mm. long unravelling; lime gland 6 mm. long, angled. Proximal oviduct to junction of vas deferens 3.5 mm., middle region in coiled state 22 mm. long, distal region 4 mm. long. Hermaphrodite gland  $8.5 \times 6$  mm., sub-kidney-shaped, truncate posteriorly; duct 17 mm. long.

KENYA. Kiambu District, Katamayu riverine forest, 8,000 ft., 22 May, 1960, leg. R. Polhill 71.

***T. thikense* Verdcourt var.**

A cream-coloured slug with a very strongly keeled back, mantle rather smooth. Pulmonary aperture 9 mm. from the posterior margin, pallial aperture very small. Total length 5.5 cm., mantle 2.8 cm. long. The genitalia of this are undeveloped. The dart sac is clavate; the oviduct and spermatheca leave the sac in the middle of the apex. The spermathecal duct and the sac form a narrow tube. (See Fig. 15.)

KENYA. Isolated patch of forest on Ol Donyo Sabuk near Thika, 8,000 ft., leg. J. G. Williams.

Some further material, also from the same locality, has been collected by W. Wilkinson. This has been investigated by R. Polhill but is also immature. (See Fig. 16.)

Body 6 cm. long in spirit, mantle 2.8 cm. long. Body finely grooved; caudal region behind visceral cavity, 1 cm. long, smooth, unlined, distinctly notched into caudal pore, slightly keeled, but not attenuate. Shell  $6.5 \times 5.5$  mm., whitish with strongly raised nucleus, concentrically striate and, also, two broader, yellowish bands, mid-way, and near periphery. Vestibule 3.5 mm. long, narrow; atrium-dart sac 10 mm. long, 2.5 mm. wide at its widest point, flask-shaped. Two pairs of darts, in a distinct pair of lateral lobes near end of sac, so that latter appears trifid. Darts 2.25 mm. long with triangular points c. 1.5 mm. long, haft c. 0.75 mm. long, rounded and narrowing slightly towards middle. Spermatheca scarcely swollen, together with duct 6-7 mm. long. The penis enters proximal region of atrium-dart sac on right-hand side and is 4 mm. long; epiphallus only once coiled, c. 9 mm. long; lime gland 3 mm. long. In natural coiled state, proximal region of oviduct is 2-2.5 mm. long, median part is 11 mm. long and distal part is 3.5 mm. long. Hermaphrodite gland  $5.5 \times 2.5$  mm. with duct 17 mm. long.

KENYA. Ol Donyo Sabuk, 11 March, 1960, leg. W. Wilkinson.

***T. thikense* Verdcourt var.**

Mr. R. Polhill found a species of slug to be very abundant in the Karura forest, Nairobi. Although large specimens were collected, none proved to be completely sexually mature; they undoubtedly belong to the above species but are not quite the same colour as the typical form. See Fig. 17.

Body 8 cm. long in life, 6 cm. long in spirit. Colour of whole gathering noted as opaque white,

\* Further material shows that this might be more properly referred to *T. nyambenense* subsp. *violaceum*.



Fig. 22

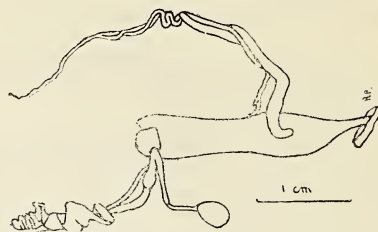


Fig. 23

slightly greyish, sometimes with an ochraceous tinge, especially dorsally. Fringe often purple but not always. Atrium-dart sac 10 mm. long, 4.5 mm. in diameter at widest point, somewhat narrowed in middle region. Spermatheca  $2.5 \times 1.5$  mm., duct short, 2.5 mm. long. Penis 8 mm. long; epiphallus in natural coiled state 3.5 mm. long; lime gland 9 mm. long. Oviduct narrow, 4 mm. to junction of vas deferens, then a convoluted middle region 14 mm. long in natural state, then a short, irregularly coiled part 5 mm. long. Hermaphrodite gland  $7 \times 4$  mm., duct 14 mm. long. Two pairs of darts, 6 mm. long, shortly triangular-pointed, with narrow haft, straight, except for very tip, which is bent.

KENYA. Nairobi, Karura Forest, 1 May, 1960, very common in wet weather, leg. R. Polhill 46.

***T. nyambenense* Verdcourt and Polhill sp. nov. subsp. *nyambenense***

Slug up to 11 cm. long, 2.7 cm. tall and 2 cm. wide at widest part of sole. Ground colour butter-yellow to ochraceous with hind body either unmarked, suffused with a beautiful salmon-pink or liver-red colouration or completely mottled with greyish-olive-green blotching. The fringe is always liver-red or salmon-coloured; head and tentacles greenish. The following notes refer to the specimen marked with olive-green blotching chosen as the holotype. Head granulate, the raised areas 1–2 mm. across, neck smooth under the mantle but lateral regions of body lined anteriorly and further back, continuously from the mantle, the lines running at a low angle to the foot and caudal region. Keel marked but not very raised, caudal flap very short, 1–2 mm. long; the pore beneath is extended as a dorsal groove down to the tip of the foot. Fringe vertically striate, sole with median band up to 4.5 mm. wide. Mantle  $4.5 \times 3$  cm., granulate on anterior free part, slightly trilobed behind, respiratory pore 2.7 cm. from the front edge. Shell broadly ovate, very thin, brittle and cracked,  $12 \times 10$  mm., nucleus median, posterior, raised 2 mm., white, opaque, shell becoming gradually more transparent towards the margin, concentrically striate.

Jaw typical of the genus, bluntly and shallowly crescentic, with a median lobe on inner side, 6 mm. broad, median width 1.5 mm. Radula with central tooth conspicuous with a median cusp smaller than in the lateral teeth, and equal lateral cusps. Lateral teeth (65–) 70 (–74), ectocone conspicuous, entocone gradually getting smaller, marginals (22–) 28 (–30), lacking an entocone, median lobe longer,



more slender. Genitalia: atrium 3.1 cm. long, first 5 mm. thin-walled, undeveloped, anterior 1 cm. of swollen part 6–7 mm. in diameter, then narrowing behind penis entrance to a diameter of 5–5.5 mm., somewhat twisted. Dart sacs conspicuous as two prongs, the "V" between them 1.5 mm. deep and the sulcus continued a further 3 mm. Darts in two pairs of 2, each 2.7 cm. long, blade triangular, 2 mm. long, haft flattened on one side for first 14 mm., then angles become less conspicuous and haft broadens to 1 mm., tapering again in last 7 mm., slightly calloused near the tip. Dart in water, under magnification of  $\times 50$  or more, pilose with the fine upturned ends of projecting crystals, especially on the forepart of the haft. Spermatheca scarcely developed, 3 mm.  $\times$  3 mm., duct 10 mm. long and 1 mm. wide. Penis 3 cm. long, passing back a short distance, looping forward in a hairpin and then back again under the retractor muscle. Epiphallus 15 mm. long in the convoluted state, lime gland 2.9 cm. long, flagellum 2 mm. long. Vagina adnate to left-hand dart sac, and although the aperture into the atrium is actually median, most of the pouch is ventral and about 4 mm. long. After a very short common spermatheca-oviduct, the proximal part of the oviduct forms a pear-shaped swelling c. 5.5 mm. long; the overall length of the unravelled oviduct is 7 cm. Albumen gland pear-shaped, 1.5  $\times$  1 cm. Hermaphrodite gland 1.5  $\times$  0.9 cm., duct 5.2 cm. long, convoluted proximally.

A light-coloured paratype without spots or suffusion was also dissected; it measured 10.5 cm. in length and had external characters as above save for colour. Male parts of genitalia very similar with long penis (2.9 cm.) and lime gland (2.6 cm.); atrium 2.5  $\times$  0.6 cm., cylindric, apex blunt, dart sacs not divergent; darts 4, 2.3 cm. long, pilose. Vagina scarcely developed but adnate to left-hand dart sac, pouch ventral, oviduct with proximal swelling, rest of duct attenuated, not as wide as in holotype. Albumen gland much smaller, 9  $\times$  6 mm., hermaphrodite gland 16  $\times$  10 mm. These are differences which might be expected of a functionally male specimen.

A further three specimens were opened and measured; the results, together with the above, are tabulated below.

Specimen	Length of specimen	Atrium $\pm$ bifurcate	Atrium, length $\times$ width	Oviduct, width	Penis, length	Albumen gland, length $\times$ width	Hermaphrodite gland, length $\times$ width
	cm.		mm.	mm.	mm.	mm.	mm.
1	11.0	+	31 $\times$ 7	4.0	30	15 $\times$ 10	15 $\times$ 9
2	10.5	—	25 $\times$ 6	3.0	29	9 $\times$ 6	16 $\times$ 10
3	10.0	+	31 $\times$ 6	5.0	25	11 $\times$ 6	14 $\times$ 5
4	9.0	+	21 $\times$ 4	2.5	20	9 $\times$ 4	12 $\times$ 7
5	9.5	—	23 $\times$ 6	3.0	23	11 $\times$ 6	14 $\times$ 10

KENYA. Nyambeni Hills, Kirima, in wet upland rain forest, about 6,200–7,500 ft., October 1960, fairly common, leg. Mrs. Hemming, Mrs. Howland and Dr. and Mrs. Verdcourt (holotype in Coryndon Museum, Nairobi, paratypes in Coryndon and British Museums) (Fig. 22).

A further specimen from Meru belongs to this species but more material is required to place it but it would appear to belong to the typical subspecies.

Body 7 cm. long (in spirit), 1.8 cm. high and 1.6 cm. wide, white with reddish-salmon fringe; head and tentacles yellowish. Head granulate, neck smooth; lines from mid-mantle region running back at a low angle to foot and caudal region, conspicuous. Keel slight, posteriorly truncate, caudal flap very short. Fringe vertically striate, sole with median band to 6 mm. wide. The specimen was sexually immature, the atrium 25 mm. long, first 6 mm. undeveloped, tubular, the thick-walled region sub-cylindric, slightly narrowed above the penis entrance, widest near apex, c. 5 mm. in diameter. Four darts in two pairs. The penis passes a short way back, then bends in a hairpin forward and then back again under retractor muscle, 22 mm. long; epiphallus 13 mm. long, lime gland 14 mm. long, flagellum 0.8 mm. long. Vagina adnate to left-hand dart sac and filling space between the two points, so that the apex is truncate. Spermatheca 3  $\times$  3 mm., duct 8 mm. long. Proximal swelling of oviduct 4.5 mm. long; oviduct unravelled 4.5 cm. long. Albumen gland undeveloped, very thin and irregular, c. 20  $\times$  5 mm. Hermaphrodite gland ovoid, 12  $\times$  6 mm., duct 3.2 cm. long, convolute.

KENYA. Meru, in upland rain forest, October 1960, leg. Verdcourt and Polhill 168. (Fig. 23.)

*T. nyambenense* Verdcourt and Polhill subsp. *violaceum* Verdcourt and Polhill subsp. nov.

Slug about 10 cm. long, 2.3 cm. tall and 1.7 cm. wide. Ground colour creamy-yellow, mantle not marked but hind body sepia or frequently suffused with bright purple, fringe always purple. Sole more or less faintly tinged purplish with median band lighter. Head granulate, raised areas 0.5–1 mm. across, skin under mantle also slightly granulate, areas 1–2 mm. across. Fore part of body lined only laterally and almost vertically, but from where mantle becomes adnate, lines run from mantle at a low angle to the foot and caudal region. Keel very pronounced, more or less conspicuously sinuate, caudal flap short. Mantle 4.4 cm. long, slightly trilobed behind, rounded to truncate in front, respiratory pore 2.8 cm. from front; granulate at least in front half, raised areas c. 2 mm. across, lines not deeply impressed. Fringe vertically striate, sole with median band, transversely striate up to 6 mm. across. Caudal gland attenuate, pear-shaped,  $11 \times 3$  mm., separated from visceral cavity by a thin wall. Body wall very thick posteriorly, 6 mm. thick just in front of caudal gland and still 5 mm. thick 3.5 cm. from tail, then narrowing suddenly and in middle region c. 1 mm. thick—in spirit, specimens blow out in this region. Genitalia: atrium partially everted, with darts protruding 1.2 cm.; a second specimen therefore chosen for general drawing. Atrium partially everted,  $2.3 \times 0.9$  cm., sub-cylindric, narrowest above middle. Darts in two pairs of 2; two are rather more curved than the others (see fig.); blade short, c. 1 mm. in section, either triangular or else flattened on one side and rounded on the other; the haft narrows slightly, and after c. 13 mm. begins to thicken to c. 1 mm. at 20 mm., then tapers, slightly calloused posteriorly. Upturned ends of crystals give a pilose appearance especially in narrow haft part when mounted in water under magnifications of more than  $\times 50$ . Spermatheca pear-shaped  $8 \times 6$  mm., duct 2.6 cm. long. Penis 2.6 cm. long, when papilla extruded, epiphallus 1.6 cm. long, lime gland 2.7 cm. long and flagellum 2 mm. long. Dart sacs separated for about 4 mm., but gap filled by vagina (Figs. c and d) which is adnate to the left-hand dart sac. A short common spermatheca-oviduct leaves pouch ventrally, proximal oviduct with a pear-shaped swelling 6 mm. long; oviduct unravelled 9 cm. long in all. Albumen gland shield-shaped,  $16 \times 10$  mm., hermaphrodite gland,  $13 \times 8$  mm., ovoid; duct 5.5 cm. long, convoluted for most of its length.

A second specimen is 12.5 cm. long. The shell is broadly ovate,  $11 \times 10$  mm., thin, nucleus raised 2 mm., opaque, becoming more transparent towards margin, concentrically striate. Jaw characteristic of the genus, bluntly and shallowly crescentic, with a median lobe inside, 5 mm. broad and 2 mm. wide in the middle. Radula formula about  $30 : 40 : C : 40 : 30$ , but transition between laterals and marginals obscure, teeth similarly shaped to those of *T. thikense*. Genitalia: atrium-dart sac 4 cm. long and 8 mm. wide, sub-cylindrical, slightly narrowed below entrance of penis, very asymmetrical at the apex, scarcely sulcate; vagina closely adnate to dart sac. Spermatheca  $8 \times 5.5$  mm., duct 2.5 cm. long. Penis 2.5 cm. long, looping posteriorly, then forward and then back again under the retractor muscle; epiphallus 2.3 cm. long, lime gland 3.8 cm. long, flagellum 1.8 mm. long. Basal swelling of oviduct 8 mm. long, overall length of oviduct unravelled 9.5 cm. and c. 5 mm. wide. Albumen gland quadri-lateral,  $12 \times 11$  mm. Hermaphrodite gland ovoid  $12 \times 8$  mm., duct 5.8 cm. long, convoluted for most of its length.

A third specimen of 7 cm. in length proved to be a juvenile. The organs were little developed; atrium  $11 \times 3.5$  mm., flask-shaped, widest at apex, where dart sacs are slightly prominent and the vagina extending out between them, pouch mainly ventral. Even at this stage the darts are fully differentiated, although small.

KENYA. N.E. slopes of Mt. Kenya, Marimba Forest, upland rain forest at about 7,500 ft., October 1960, four specimens, leg. Polhill and Verdcourt 183a (four specimens, first mentioned chosen as holotype, in Coryndon Museum, Nairobi, paratypes in Coryndon Museum and British Museum) (Fig. 24).

*T. bambuseti* Verdcourt and Polhill sp. nov.

Slug up to 8.5 cm. long, 2 cm. high and 1.4 cm. wide; ground colour greenish-ochre, covered with a mottling of small, white, irregular spots; mantle proximally a much lighter yellow 3.2 cm. long. Head white, granulate, the raised areas 1–2 mm. across. Body thin-walled, smooth anteriorly but a few lines run backwards from the mid-mantle region, becoming very inconspicuous farther back. Keel broad and well developed, caudal flap very short, obtuse, with pore below. Fringe yellow with conspicuous brown vertical striae. Sole a very pale yellow with a median band up to 4 mm. wide, translucent white. Shell with calcified part ovate, truncate,  $7 \times 6$  mm. with a peripheral membrane 0.5–1 mm. wide. Nucleus median-posterior, raised c. 0.75 mm., markedly opaque. The opaqueness decreases steadily towards the margin interrupted by concentric striations.

The jaw is typical of the genus—a shallow, blunt-ended crescent with a median lobe on the inner side—4 mm. wide and 1.5 mm. across at the middle. Radula with central tooth conspicuous, the central cusp smaller than on adjacent teeth, the lateral cusps arising at approximately the same level. The rest of the teeth are not easily divisible into laterals and marginals, the central cusp becomes gradually narrower outwards, the ectocone is conspicuous throughout, the entocone smaller and placed lower down, becoming absent from the outermost marginals. There are 100–104 teeth on each



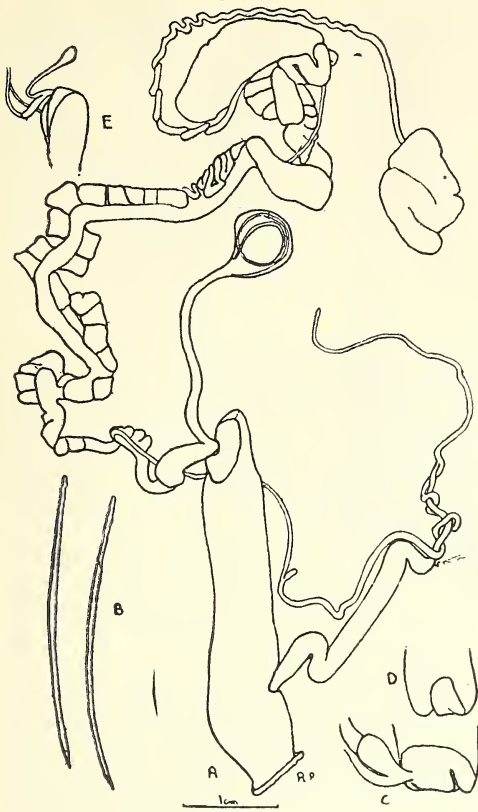


Fig. 24

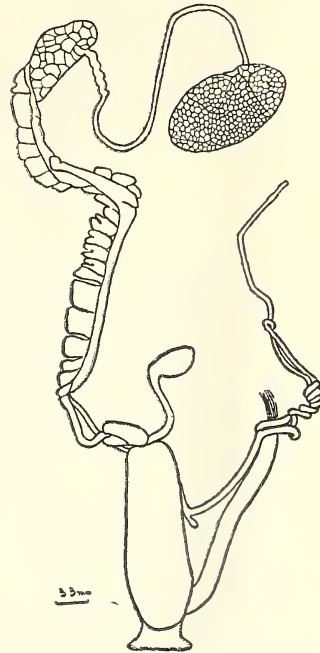


Fig. 19

side, the last 15–18 decreasing rapidly in size and followed by a few rudiments without cusps and excluded from the count. Genitalia: atrium-dart sac cylindrical, 1.9 cm. long and up to 0.8 cm. wide, sub-cylindrical, tapering to a width of 5 mm. distally, truncate, the dart-sac lobes not conspicuously developed. Four darts, each c. 18 mm. long and up to 0.4 mm. wide near base, tapering rather quickly about 6 mm. from this end and then very gradually to the blade. Blade short, three-sided, about 1 mm. long. Haft shallowly punctate-reticulate with a few small callouses. Under a high-powered objective the crystals stand out a little way to give a slightly appressed pilose appearance (this effect is more conspicuous in *T. kempi* (Polhill 70) but much less so in *T. thikense*). Spermatheca  $4.5 \times 2$  mm., pear-shaped, pointed; duct 11 mm. long. Penis leaves on left-hand side of atrium, passes under retractor muscle and then directly back; epiphallus very twisted, 15 mm. long in this state, lime gland 20 mm. long. Vas deferens passes back to atrium where joined by 1 mm long, bud-like flagellum. Oviduct 5.5 cm. long, with a conspicuous swollen, pear-shaped, proximal region  $4 \times 3$  mm. Duct leaves ventrally to atrium, passes backwards and is joined by vas deferens after c. 10 mm.; it is much convoluted and tape-like, about 3 mm. across. After about 2 cm. it loops back to base of atrium and then in a hairpin posteriorly again, very soon entering albumen gland. Albumen gland  $9 \times 5$  mm. Hermaphrodite gland  $12 \times 7$  mm., granulate, duct 3.5 cm. long, convoluted proximally. (Fig. 19.)

KENYA. West side of Aberdares, North Kinangop–Nyeri road, 10,000 ft., 31 July, 1960, aestivating (?) in the cavities of broken bamboos (*Arundinaria alpina*), leg. R. Polhill 154 (holotype and one paratype in Coryndon Museum, Nairobi, paratype in British Museum).

It is certain that the following somewhat undeveloped specimen although unspotted also belongs to this species.

A green-yellowish-white slug with more or less white mantle. Dorsum very strongly keeled indeed

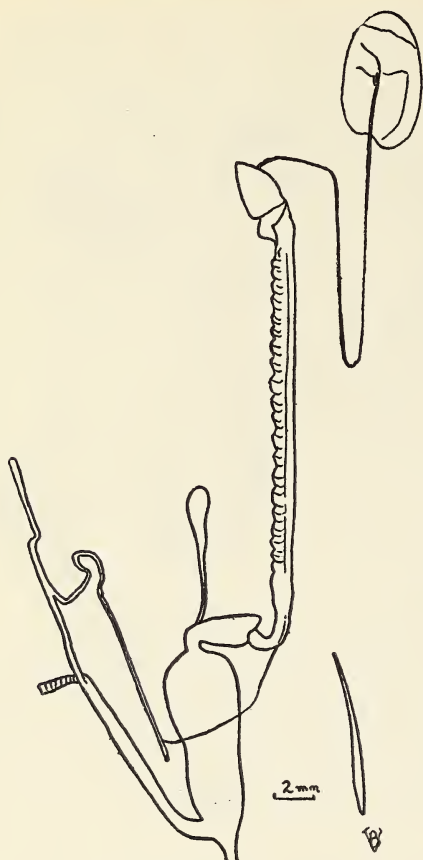


Fig. 18

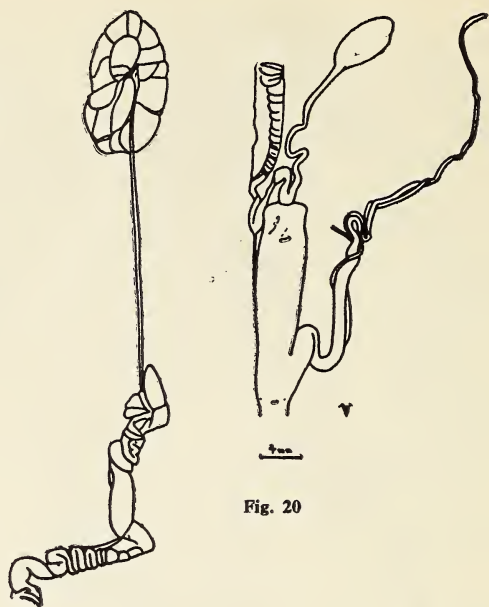


Fig. 20

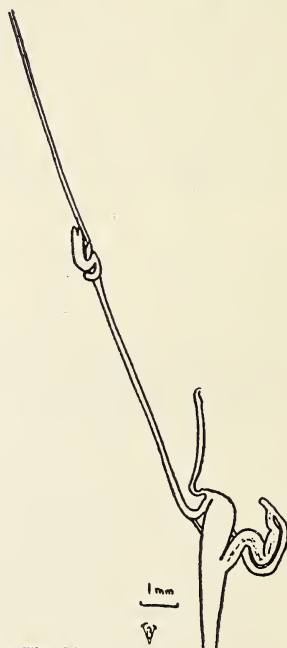


Fig. 21

from mantle edge to the caudal pore; at the posterior end the keel is 6 mm. high. The reticulation on the hind body is marked out with pure white. In spirit the colour of the animal turned to very pale grey and the keel is even more marked. The animal is 6.5 cm. long and 1.15 cm. wide at the sole. The mantle is 3.2 cm. long and the small pulmonary aperture situated well behind the middle of the mantle, 1.3 cm. from the posterior margin. The hind body is 3.3 cm. long and the keel overhangs the caudal pore for 1.2 cm. in life. The shell is almost round,  $6.5 \times 5.5$  mm. The genitalia are not fully



mature but are shown in Fig. 18. The characteristic way the vagina enters the apex of the dart sac may be a juvenile character. The dart sac is sub-cylindrical, widening towards the apex, about 8.5 mm. long and 3.5 mm. wide. The darts are in two pairs, thickened towards the sharply pointed end, 7.8 mm. long. The spermatheca is clavate  $2 \times 1.1$  mm. with a duct  $5 \times 0.3$  mm. At the base of the oviduct there is a thickened portion  $3.5 \times 3$  mm. which is bilobed on one side. The radula is 8 mm. long and 4.5 mm. wide; there are about 100 teeth in each row on either side of the central tooth including 24 laterals and about five transitionals. The ten outermost marginals are irregular and have 3-4 small cusplets on the outside of the cusp. There is a noticeable accessory cusplet on the outer edge at the top of the cusp of the 61st tooth from the margin. As one proceeds outwards this cusplet moves downwards until by the 20th tooth from the margin the cusp appears unequally bifid with the following ten teeth similar. The jaw is 3.2 mm. wide.

KENYA. Limuru to Kinangop, Kinale, bamboo forest, leg. W. Wilkinson.

*T. sp. nov.*

A greenish-brown slug with purple fringes in life; in spirit the colour is brownish-ochraceous with the keel and mantle darker greyish. Hind body keeled; mantle noticeably bilobed anteriorly, surface with vertical reddish rugae; pulmonary aperture 9 mm. from the posterior margin. Pallial aperture almost imperceptible. Total length 8.5 cm. long, mantle 2.6 cm. long and dorsum 5 cm. long. Sole areas  $6 + 2.5 + 6$  mm. wide respectively. Shell almost round, 6.5 mm. long and 6 mm. wide. Dart sac cylindrical, somewhat narrowed below, truncate above, 2 cm. long; containing two sacs each with a pair of darts; darts curved, 1.8 cm. long, with triangular cutting edge at one end and pointed at the other. Oviduct and spermathecal duct enter the combined atrium and dart sac at the middle of the apex. The spermatheca is ovoid-elliptic, 7 mm. long and 3 mm. wide; the duct is slender and about 15 mm. long. (Fig. 20.)

TANGANYIKA. East Usambaras, Amani, by R. Kwamkuyu, leg. B. Verdcourt. This specimen probably represents a new species but only one was found. The lobing of the mantle and the apical emergence of the ducts are distinctive features.

[*T. polloneræ* Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 295, pl. 8, f.7 (1919)]

A tawny-olive slug clouded and spotted with dull blackish-grey in a very irregular pattern in which three longitudinal "clouds" can be made out on the mantle and two wide lateral areas and a narrow dorsal band on the hind body which is keeled only at the rear. Sole tawny-olive. Animal 4.3 cm. long, sole 8 mm. wide, mantle 1.6 cm. long. Dart sac widened towards the apex with two rounded lobes, vagina apparently leaving one of them at the extreme apex. Two pairs of darts which are broadest at about the distal third, 5 mm. long. Pilsbry's drawings were made from very badly preserved material. Judging by the way that *T. thikense* develops the anatomy shown could easily be that of a juvenile. I have seen no material of the species.

BELGIAN CONGO. Ituri Forest, Medje, leg. Lang and Chapin. This may occur in Uganda.]

*T. martensi* (Heynemann) ex Simroth

Simroth in Nova Acta Leop.-Carol. 54, 57, t.3, f.9 (1889)

*Dendrolimax martensi* Heynemann in Nachrbl. deutsch malak. Ges. 1882, 183 and in Jahrb. deutsch malak. Ges. 12, 293 (1885)

This species was not properly described by Heynemann and Simroth is the proper author of the name.

Slug 4.6 cm. long, sides yellow-grey on a blackish ground and with glaring white spots of secretion. Keel black throughout and dorsum blackish-grey. The mantle has glaring white spots and irregular lines. Dart sac widened at the base, narrowed above, bifid, the lobes parallel and apparently bluntly pointed. The spermatheca is globular, the oviduct not swollen but the vagina is swollen just below the junction of the spermathecal duct and the oviduct. There are three pairs of darts about 2.2 cm. long.

TANGANYIKA. Ushambola (=Usambara), leg. Gerard; Simroth, however, says "nordlich von Mombasa". This appears to be a very distinct species. I have looked through the descriptions of the external features of all the slugs I collected in the East Usambaras (now in coll. S. Urban) but can find nothing like it and must assume that I never saw specimens which could conceivably belong to this species.

Indeterminate species

A further small immature slug from Tanganyika had very immature genitalia but is probably a *Trichotoxon* subg. *Trichotoxon* sp. The hind body is strongly keeled, grey-blue with a yellow-green

fringe. The mantle is covered with striking reddish-brown vertical rugae. Further adult material is needed since the juvenile colouration is often very different from that of the adult.

TANGANYIKA. East Usambaras, Sigi, leg. B. Verdcourt.

Several immature specimens of a distinctive slug found in the Coast Province of Kenya also appear to belong to this subgenus.

Hind body strongly keeled, keel rather sharp, dark brown, flanks below grey-brown and darker brown in patches, fringe orange-brown; mantle shagreened, pale brown covered with darker brown, closely placed, lozenge-shaped spots; tentacles grey-brown. Body 4 cm. long and 8 mm. wide, mantle 1.45 cm. long; pulmonary aperture 9 mm. from the anterior margin; pallial hole not perceptible. In one specimen the genitalia were completely undeveloped and in the other they were vestigial but suggest *Trichotoxon* s.s. (see Fig. 21).

KENYA. Kwale District, Marenji Forest Reserve on the Mrima Road joining the coast road to the main Tanga-Kwale road, on *Popowia*, leg. B. Verdcourt; also in forest three miles south of Mrima Hill, leg. B. Verdcourt. When first disturbed this species gives a convulsive jerk and falls to the ground.

The next species forms a group by itself which has not received a name. It is characterised by all the organs including the penis leaving the apex of the dart sac.

*T. robustum* Simroth in Abh. Senck. naturf. Ges. 19, 283, t.2, f.1-5 (1896)

Animal 8.3-10 cm. long, greyish-white; mantle reticulate; hind body keeled along its entire length. Penis, spermathecal duct and oviduct all leaving from the apex of the dart sac. Dart sac swollen, clavate, narrowed below, 3 cm. long; 14 glabrous darts 2.6-3 cm. long. Spermatheca elongate-ovate, narrowed apically, duct about 1.5 times as long as the sac, much dilated basally.

TANGANYIKA. Kilimanjaro, 1,200-2,700 m., leg. Volkens "white slug in Kultur-region".

No material of this slug has come to hand; all the large slugs collected on Kilimanjaro which have come into my hands or been collected there by myself have proved to be members of the subgenus *Polytoxon*.

#### CAPTIONS

- Fig. 8b. *Trichotoxon heyneimanni* Simroth. Tanganyika, East Usambaras, Mt. Bomole, Amani, B. Verdcourt. Genitalia, dart and one spermatophore.
- Fig. 9. *Trichotoxon heyneimanni* Simroth. Another specimen from same locality. Genitalia.
- Fig. 10. *Trichotoxon* cf. *kempi* Pollonera. Kenya, Kiambu District, Katamayu Forest, R. Polhill 70. Genitalia, dart, shell and organs *in situ* with dorsal body-wall removed.
- Fig. 11. *Trichotoxon thikense* Verdcourt. Kenya, Thika, Blue Posts Hotel, W. Wilkinson. Organs *in situ* and genitalia unravelled.
- Fig. 12. *Trichotoxon thikense* Verdcourt. Kenya, Thika, Chania Gorge, B. Verdcourt. (a) Dart sac of juvenile, (b) dart sac from larger juvenile, (c) darts from the two.
- Fig. 13. *Trichotoxon thikense* Verdcourt var. Kenya, Uplands, Katamayu Forest, J. G. Williams. Genitalia.
- Fig. 14. *Trichotoxon thikense* Verdcourt var. Kenya, Katamayu Forest, R. Polhill 71. Organs *in situ* and genitalia unravelled.
- Fig. 15. *Trichotoxon thikense* Verdcourt var. Kenya, Ol Donyo Sabuk, J. G. Williams. Genitalia of juvenile.
- Fig. 16. *Trichotoxon thikense* Verdcourt var. Kenya, Ol Donyo Sabuk, W. Wilkinson. Organs *in situ*, shell, genitalia unravelled and darts.
- Fig. 17. *Trichotoxon thikense* Verdcourt var. Kenya, Karura Forest, Nairobi, R. Polhill 46. Genitalia and dart.
- Fig. 18. *Trichotoxon bambuseti* Verdcourt and Polhill. Kenya, Kinale, W. Wilkinson. Genitalia.
- Fig. 19. *Trichotoxon bambuseti* Verdcourt and Polhill. Kenya, W. Aberdares, R. Polhill 154. Holotype, genitalia and dart.
- Fig. 20. *Trichotoxon* sp. Tanganyika, Amani, R. Kwamkuyu, B. Verdcourt. Genitalia.
- Fig. 21. *Trichotoxon* sp. ? Kenya, Kwale District, Marenji Forest, near Mrima, B. Verdcourt. Very juvenile genitalia.
- Fig. 22. *Trichotoxon nyambenense* Verdcourt and Polhill subsp. *nyambenense*. Nyambeni Hills, Hemming, Howland and Verdcourt. (a) Genitalia of holotype, (b) apex of atrium-dart sac from ventral side, showing vagina adnate to left-hand dart sac, (c) apex of atrium of paratype from ventral side, (d) apex of atrium of paratype from dorsal side, (e) dart from holotype.
- Fig. 23. *Trichotoxon nyambenense* Verdcourt and Polhill ? subsp. *nyambenense*. Kenya, Meru, Verdcourt and Polhill 168. Genitalia.
- Fig. 24. *Trichotoxon nyambenense* Verdcourt and Polhill subsp. *violaceum*. N.E. Mt. Kenya, Marimba Forest, Polhill and Verdcourt 183a. (a) Genitalia of paratype, (b) darts of holotype, (c) and (d) apex of atrium-dart sac, (e) apex of atrium-dart sac of juvenile paratype.



## EAST AFRICAN SLUGS OF THE FAMILY UROCYCLIDAE—PART 4

By B. VERDCOURT, Ph.D., F.L.S., B.Sc. and R. POLHILL, B.A.

### TRICHOTOXON (*continued*)

Subgenus *Polytoxon* Simroth in S.B. naturf. Ges. Lpz. (1895–6), 149 (1897). Subgenotype, *T. auriantiacum* Simroth

Oviduct, spermathecal duct and penis all originating near the base of the dart sac.

Before giving a key to the species, mention must be made of two species which at present are (and probably always will be) unidentifiable. In each case the short Latin descriptions appear to indicate a similarity to *T. robustum* Simroth but the genitalia are not figured. Both *T. neumanni* Simroth from an untraceable locality and *T. athrix* may be identical with one of the forms described below but only the latter is likely to have its identity solved when topotypes are collected. Efforts to trace the type locality of *T. neumanni* Simroth have failed. What is known of these two species is given immediately after the following key.

#### Key to the species\*

1. Dart sac ovoid, short and rounded (perhaps immature), with four darts; slug brownish with black spots . . . . . *T. pardus*
1. Dart sac elongate, rounded or truncate above . . . . . 2
2. Dart sac with 2–8 darts . . . . . 3
2. Dart sac with numerous darts . . . . . 4
3. Dart sac elongate, more or less truncate, darts stated to be two only, spermatheca ovoid-globose with duct three times as long . . . . . *T. roccatii*
3. Dart sac elongate, truncate, with eight darts, spermatheca fusiform, attenuated at the apex, constricted in the middle, equalling or longer than the duct . . . . . *T. ruwenzoriense*
4. Dart sac rounded above . . . . . 5
4. Dart sac truncate above . . . . . (*T. copleyi*) 6
5. Spermatheca ovate-elongate, narrowed above, duct about as long . . . . . *T. volkensii*
5. Spermatheca ovate-elongate, duct very much longer than the sac . . . . . *T. kilimanjaricum*
6. All specimens in population apparently unicolorous buff; spermatheca ovoid to globose about a third as long as its duct; radula with about 28–30 laterals and further six transitionals, outermost 31–34 marginals either irregular or with small cusplet on outer edge of cusp . . . . . *T. copleyi copleyi*
6. All specimens in population apparently unicolorous buff; spermatheca narrowly spindle-shaped to ovoid-triangular equalling to only about a third as long as the duct, usually just over half as long; radula with about 20–22 laterals and 6–7 transitionals, outermost 19–22 marginals either irregular or with a cusplet on the outer side of the cusp . . . . . *T. copleyi maranguense*
6. Population consisting of very variously coloured animals varying from uniform buff to uniform blackish with various intermediate stages of black spots or reticulated patterns on a pale ground; spermatheca ovoid or elongate just under one third the length of the duct . . . . . *T. copleyi kulalense*
6. Animal creamy-grey with pattern of dark purple-brown; spermatheca rather undeveloped, narrow with a very narrow tip, about half the length of the duct; radula with about 24 laterals and seven transitionals, outermost 27 marginals either irregular or with a distinct cusplet on the outer margin of the cusp . . . . . *T. copleyi moloense*
6. All specimens in populations apparently cream-coloured with open, pale buff-brown reticulate pattern; spermatheca elongate or ovoid, sometimes narrowed at the tip, just over a third as long as the duct; radula with about 25 laterals and seven transitionals, outermost 38 marginals either irregular or with a distinct cusplet on the outer edge of the cusp . . . . . *T. copleyi reticulatum*

\* *T. auriantiacum* is not included.

*T. neumanni* Simroth in Abh. Senck. naturf. Ges. 19, 290, t.2, f.6-8 (1896) (not *Spirotoxon neumanni* Simroth in Zool. Jahr. Abt. Syst. 19, 704 (1904) which is now placed in *Trichotoxon* subgenus *Spirotoxon* and was described from Doko in Ethiopia. A new name is needed and I propose *Trichotoxon simrothi* nom. nov.)

Slug 4.7-5.15 cm. long; ground colour a dirty leather brown with several flecks of black pigment; mantle and sides greyish; back keeled behind. Said to be similar to *T. robustum* but smaller. It is not made clear if the genitalia of this species are similar to those of *T. robustum* or not; my interpretation of Simroth's description is that they are. The penis is said to be much thicker at the base than in the last species; dart sac 2 cm. long; 18 glabrous darts, incrassate at the base. Pilsbry (1919) compares his *T. (Polytoxon) pardus* with this present species and says that Simroth's figure of the species is similar but I cannot find that Simroth ever figured more than the penis, mouth and atrium. The number of darts appears to indicate a species of *Polytoxon*. The name may have to be dropped as being unrecognisable.

TANGANYIKA. Kwa Kitoto, leg. Neumann (in Berlin Museum).

I have not been able to trace this locality and the specimen is certainly no longer in the Berlin Museum.

*T. athrix* Simroth in Abh. Senck. naturf. Ges. 19, 292, t.2, f.9 (1896)

Animal 4-5.2 cm. long, rather darker in colour than the last species with blackish tinge on back near the keel and darker side areas of the sole. Simroth states that this species differs from the last by its more open breathing hole, less strong keel, and the great number of slender smooth not swollen darts. Simroth stated that despite size the genitalia were not fully developed. The dart sac is 1.5 cm. long and the darts about 2 cm. long. It is not clear if this species has genitalia similar to those of *T. robustum* or not but from the description it appears that they are. Yet the number of darts indicates the subgenus *Polytoxon*. This name may also have to be dropped as being unrecognisable.

TANGANYIKA. Pori Mangati Ufirmi, leg. Neumann (Berlin Museum). Pori is Swahili for bushland and there is a Mangati in Ufime near the footslopes of Mt. Hanang. A collection of slugs from this area might solve the problem of this species.

*T. auriantiacum* Simroth in S.B. naturf. Ges. Lpz. 22-23 (1895-6), 149 (1897) and Simroth in Reise in Ostafrika A. Voeltzkow 1903-5, Wiss. Ergebn. 2, 605, t.26, f.1-2 (1910)

Slug about 8.5-9 cm. long, 1.5-2 cm. tall and 1.4 cm. wide, entirely yellow-ochre or clear orange save for the middle zone of the sole which is white and the "nape" (? part below the mantle). Mantle granularly wrinkled. The genitalia are described but not figured and no measurements are given. It needs recollecting.

TANGANYIKA. Mountain near Magila, near Pangani, leg. O. Neumann (Berlin Museum). There is a Magila near Mt. Mlinga but this is not very near to Pangani.

An orange-ochre slug from Lukenya Plateau, a rocky bluff in Machakos District some 20 miles from Nairobi, Kenya, collected by Mr. P. R. O. Bally, Dr. G. Reynolds and Sir Evelyn Baring may possibly be this species although far from the type locality and from a very much higher altitude. Unfortunately the specimen dried up and only the original notes can be given. The specimen was found on *Ormocarpum*. When fully extended the animal measures 6.3-7.5 cm. long and 1 cm. wide but when contracted only 2.5 cm. long. The pallial pore is small. The back and mantle are clear ochre-yellow with no marks of any kind; the tentacles, outer sole areas and fringe are darker ochre; the mid area of the foot is grey. The caudal pore has a blunt tail overhanging it. The genitalia are similar to those of *T. ruwenzoriense* Pilsbry but were not mature; the spermatheca is very much smaller with a long slender duct. It is probably allied to *T. roccatii* Pollonera.

*T. roccatii* Pollonera in Bull. Mus. Zool. Anat. Comp. Torino 21 (543), 4 (1906) and in Il Ruwenzori, 1, 188, t.18, f.14-16 (1909); Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 299 (1919); Watson in Connolly in Proc. Malac. Soc. 17, 174 (1927)

A unicolorous earth-coloured slug devoid of markings. Mantle ovate, minutely subgranular. Back somewhat irregularly rugose, obtusely keeled throughout its length and acutely so above the gland. Sole 7.3 cm. long, back 5.8 cm. long and mantle 3.9 cm. long. Dart sac elongate, tapering cylindrical towards the apex but extreme apex broadened and blunt. Spermatheca ovoid with a long narrow duct over three times as long as the sac. Pilsbry states that there are only two villous darts; Pollonera compares the species only with *T. heyneimanni* and not with any species of nearer affinity. Watson (1927) tentatively refers to this species (as a variety) a specimen collected at Nagichot, Didinga, in the S.E. Sudan, by G. D. Hale Carpenter.

UGANDA. Ruwenzori, E. slope of the Mobuku Valley, Nakitawa (Abruzzi Exped.).



Members of the subgenus *Polytoxon* are exceedingly common in various parts of East Africa and I have found great difficulty in classifying them. Specimens from Arusha, Kilimanjaro, Nairobi, Thika and Mt. Kulal all appear to belong to a complex and are either closely related species or races of one widespread species. The general anatomy is very close to that of *T. roccatii* Pollonera. There are however 15 or more darts and not two (I believe Pilsbry might have been in error over this)—I cannot find that Pollonera mentioned the number of darts in his description. *T. volkensii* Simroth is another allied species but in this the spermatheca is scarcely longer than the duct and the dart sac is smoothly rounded above and not truncate. I have used a new name since species of this complex are of economic importance and it is necessary that a name should be available.

***T. copleyi* Verdcourt sp. nov. subsp. *copleyi***

A very large slug 12–16.5 cm. long when outstretched alive, and 2 cm. wide; in spirit about 8 cm. long, 2 cm. wide and 2 cm. tall. Back pale bistre to greyish-ochraceous or whitish-ochraceous, sometimes with vague brownish marks on the sides of the hind body; grooves between the rugae, deep, reticulate, deeper brown. Head grey to grey-black; fringe ochraceous-brown, grey-brown or dull purplish-grey. Mantle sometimes paler than the body, yellow-buff, bistre or whitish-ochre shaded brown, reticulately rugose or shagreened. Pulmonary aperture just behind middle of the mantle, 2.5 cm. behind the anterior margin in a mantle 4.7 cm. long; pallial orifice small to large, up to  $6 \times 3$  mm. Outer areas of the sole pale grey-brown or purple-brown about 5 mm. wide, inner zone very pale bistre, minutely speckled, about 3 mm. wide. Mantle about 7 cm. long in live animal, 4.6–4.7 cm. long and 3 cm. wide in spirit material. Shell large, solid, brown, in one specimen filled with callus and solid throughout, concentrically and radially striate, 13–16 mm. long, 8.5–11.5 mm. wide and 2–4 mm. tall; the nucleus is situated above the posterior margin or projects over it. Dart sac large, cylindrical or subtrigonal-cylindrical above, dilated and bulbous at the base, obliquely truncate at the apex, up to 2 cm. long. The large specimen 16.5 cm. long, having the callus-filled shell, had a dart sac only 1.5 cm. long. I cannot believe that the genitalia were immature—possibly it was a senile specimen. There are about 15 darts, 1–1.5 cm. long. The spermatheca is globose or ovoid, 4–7 mm. long and 3–3.5 mm. wide, the duct 1.2–1.8 cm. long.

The radula from the Dagoretti specimen was 9.7 mm. long and 5 mm. wide and there are 95–100 teeth in each row on either side of the central tooth. There are about 28 lateral teeth and six further transitionals; the outermost 16 marginals are irregular, some with 3–4 small cusplets; the next 15 marginals have a small cusplet on the outside margin of the main cusp; the main cusp averages 9–12  $\mu$ . The jaw is 5 mm. wide. The radula of the large specimen collected by J. G. Williams in Nairobi is 9 mm. long and 6.5 mm. wide; there are 105 teeth in each row on either side of the central teeth including 30 laterals and about six transitionals. The teeth are rather wider than usual hence the greater width of the radula for approximately the same number of teeth. The cusps on the marginals are rather wider, 12–15  $\mu$ . The 14 outermost marginals are irregular and the next 20 have a faint cusplet on the outer edge of the cusp of some of the teeth. The posterior margins of the bases of the teeth are very fimbriated. The jaw is large and thick, 6.6 mm. wide and 2.5 mm. long (mounted almost straight or slightly arcuate). See Figs. 25–26 (Page 20).

KENYA. Nairobi, leg. H. Copley (holotype in Coryndon Memorial Museum), J. G. Williams, B. Verdcourt, K. Kibui, R. Polhill; Dagoretti, leg. P. R. Hesse; Muguga near Kikuyu, leg. B. Verdcourt. This is the common slug of the Nairobi area and is particularly in evidence during the rainy seasons, April to May and also in November.

Mr. Polhill has examined a specimen collected by himself in the Westlands area of Nairobi (April 1960) and gives further details of the anatomy (Fig. 27) (Page 21).

The penis is angled near the base; the proximal part is 6 mm. long, bluntly spear-head-shaped becoming tubular; distal part 8 mm. long; epiphallus 14 mm. long in the natural contorted shape; upper flagellum 6 mm. long in natural state, 10 mm. long when extended, narrow with a recurved tip. Spermatheca globose, 6 mm. long, duct 1.5 cm. long. Atrium-dart sac 2 cm. long. Proximal convoluted part of oviduct 4.5 cm. long, distal part a little wider, 1.2 cm. long in the natural state, not unravelled. Hermaphrodite gland bluntly triangular,  $7 \times 9$  mm., duct c. 4.5 cm. long.

The following slug from a locality some distance away does not appear to differ from the above.

A large slug 9 cm. long, 2 cm. high and sole 1.2 cm. wide; ochraceous with a pale bistre foot. The body is not markedly keeled, truncate posteriorly, still 1 cm. tall near the tail; caudal flap short, c. 2 mm. long and 3 mm. high, caudal pore in notch immediately below. The genital opening is in the characteristic position just below the right-hand tentacles. The body is smooth behind the head and under the mantle, but well-marked grooves run from behind the mantle, meeting the foot at a very low angle or running into the caudal region. Mantle 4 cm. long, apparently shortly and bluntly trilobed behind, granular, the scarcely raised areas 1.5–2.5 mm. across; pallial pore median, c. 1 mm. from the posterior end. The caudal region, behind the visceral cavity, is 14 mm. long; caudal gland very distinct, 7 mm. long and only separated from the visceral cavity by a thin wall. Common attachment of main retractor muscles level with the end of the mantle; penial retractor 1 cm. further forward

Shell asymmetric, rather oblong, the right side curved further from median axis, apex blunt, base rounded, calcified part  $10 \times 6.8$  mm. with a horn-coloured peripheral strip about 1 mm. wide, except where it narrows towards the nucleus. Nucleus strongly raised (height of shell 2 mm.), its cap heavily calcified, approximately circular, c. 1.5 mm. across; there is a fairly uniform decline in opacity from here to the margin, interrupted by radial, horn-coloured growth bands. Jaw 4 mm. wide, 2 mm. broad and 1.3 mm. high, of characteristic crescent shape with median lobe on inner side; lobe conspicuous  $1 \times 0.4$  mm.

Genitalia: the atrium-dart sac is cylindrical, 2.4 cm. long, 10 mm. in diam. at widest point just behind the opening. The penis enters on right-hand side 5 mm. from the opening; the spermatheca duct and oviduct are confluent and the 1 mm. common duct enters ventrally a little behind; the atrium-dart sac tapers from this point, considerably at first and then very gradually, abruptly terminated when still 5 mm. across, scarcely lobed. Fourteen darts were counted in longitudinal folds of the thick wall, each surrounded by a thin, fairly soft amorphous sheath; each long, thin and fragile,  $20 \times c. 0.5$  mm. (at middle), slightly curved; blade irregularly angled, the angles minutely jagged, the sides irregularly surfaced—intermediate between very shallowly wrinkled and punctate—uniformly tapered to a simple point. The haft is practically smooth and rounded but the posterior end is irregularly lobed. Spermatheca ovoid,  $5 \times 4.5$  mm., shortly beaked (c. 1 mm.), duct 18 mm. long, proximal 10 mm. of duct c. 1.5–2 mm. in diam., narrowing gradually, then rapidly tapering over a short distance to a distal portion c. 0.8–1 mm. in diameter. Penis 16 mm. long, passing dorsally to left-hand side of atrium, and under right-hand retractor muscle. The epiphallus is very convoluted and passes forward close to dorsal skin over head and returns same distance in a hairpin loop—in all c. 23 mm. to junction of lime gland, which is 25 mm. long, angled towards the tip and passes posteriorly between the dorsal viscera. The flagellum is very small, white, bud-like, c. 0.5 mm. long, lodged just posterior to penis where it crosses over the atrium; the vas deferens is very thin and passes immediately ventral.

Beyond the 1 mm. long common duct of the oviduct and spermatheca the oviduct is strongly convoluted and about 4.5 cm. long in this state; the vas deferens enters 8 mm. from proximal end. The combined tubes run back on the right-hand side of the atrium to a little behind the latter, loop forward



Fig. 25

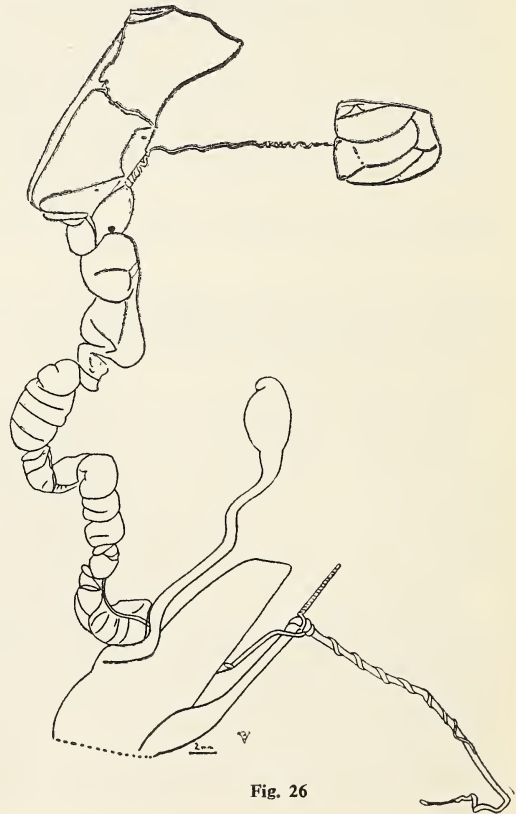
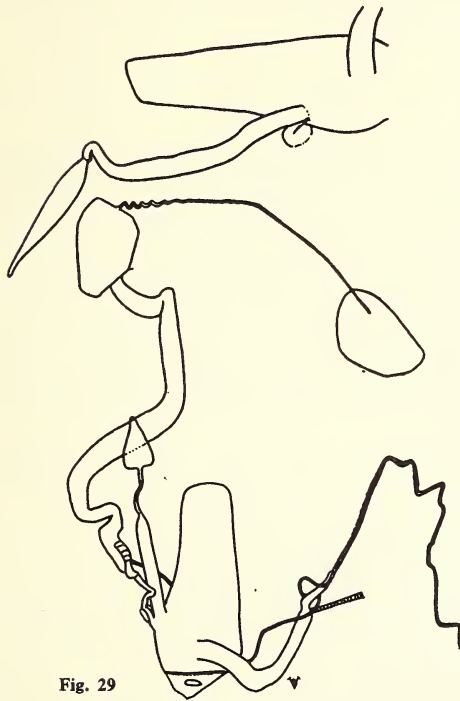
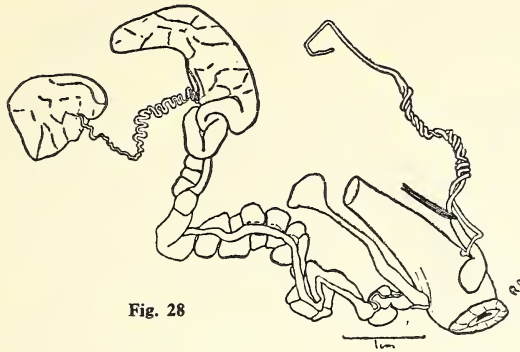


Fig. 26





nearly to the penis, cross and then make a hairpin loop back, becoming very convoluted in the final 1 cm. The albumen gland is contiguous, 10 mm. wide at the proximal end, tapering to 4 mm., slightly crescent-shaped; 20 mm. long from tip to tip. Hermaphrodite gland shortly oblong-ovoid,  $11 \times 8$  mm., with a convoluted duct 25 mm. long. Fig. 28.

KENYA. Southern Province, Mara River, Isuria Escarpment, leg. C. W. P. Harries.

A grey specimen with darker fringe and bistre sole was also collected in the same place by Mr. Harries—it appears to be identical with the specimen described above. Some specimens collected on the Tanganyika-Kenya border (but unfortunately not mature) belong either to this subspecies or to the following. There are considerable distances of very arid country between Namanga and Kilimanjaro and Nairobi and local races are to be expected. Examinations of considerable populations will be necessary to decide if such races have developed. These border specimens are grey in colour with a darker head thus differing from the ochre-coloured Nairobi specimens. The largest found was 6.5 cm. long, with a mantle 3.2 cm. long.

KENYA. Southern Province, Namanga, December 1959, leg. B. Verdcourt; between Namanga and Bissel, December 1959, leg. B. Verdcourt.

*T. copleyi maranguense* Verdcourt subsp. nov.

Living colours not recorded. Spirit material uniformly whitish grey-buff or purplish-grey save for the dark keel. The keel is pronounced throughout the length of the hind body and the caudal pore is very marked. The pulmonary aperture is 2 cm. from the anterior edge of the mantle which is polygonally reticulate. The pallial aperture is a small slit. The body is 6.8–7.6 cm. long and the sole 1.6 cm. wide, the areas being  $5.5 + 5 + 5.5$  mm. respectively; the mantle is 3 cm. long. The shell is broadly oval with the nucleus at the extreme posterior edge where shell is also highest; finely concentrically striate and with even finer striae at right angles, 9 mm. long and 7 mm. wide. Dart sac large, about 2–2.5 cm. long, obliquely truncate at the apex. Spermatheca ovoid-triangular in one specimen but narrowly spindle-shaped in another, the duct long and very narrowed at the apex.

The radula is 8.5 mm. long and 4.2 mm. wide; there are about 90 teeth in each row on either side of the central tooth including 22 lateral teeth and another seven or so transitionals. The main marginals have a long narrow cusp  $9\ \mu$  broad. The outermost 22 or so marginals have a small cusplet on the outside of the cusp some 15–18  $\mu$  from its tip save for the outermost four which are irregular. The posterior margins of the base of the teeth are fimbriated. Viewed with the naked eye the radula is distinctly divided into three longitudinal areas. Fig. 29 (Page 21).

TANGANYIKA. Kilimanjaro, Marangu, in forest zone, January 1955, leg. B. Verdcourt (holotype in Coryndon Memorial Museum).

Some further specimens from the same locality had larger dart sacs and more ovoid spermathecae. Body unicolorous white (buff-cream in spirit). Mantle sinuate behind, free in front for 12.5 mm.; pulmonary aperture 1.6 cm. from the posterior margin, pallial aperture 1.8 mm. long. The total length of the animal is 8.9 cm.; the height is 2.3 cm. and the breadth 1.7 cm., the mantle is 3.6 cm. long, the head 1.25 cm. long and the dorsum 4.9 cm. long. The sole areas are 4.5, 5 and 4.5 mm. wide respectively. The shell is  $9.5 \times 7.5$  mm., olive-brown with darker narrow zones, the nucleus close to the margin, white; sculpture consisting of concentric ridges and radial striae; callus has started to be formed below the nucleus. The dart sac is about 3.1 cm. long, very robust, rounded and dilated at the base where it is 10.5–11 mm. wide, narrowed and cylindrical at the apex which is truncate and 5 mm. wide. In one specimen the spermatheca is irregularly ovoid,  $9 \times 4$  mm., with a duct 3 cm. long and in another the spermatheca consists of an oblong-ovoid sac,  $5 \times 3.5$  mm., with an apical sac  $2 \times 2$  mm. bearing an apical beak 1 mm. long; a narrow neck 1 mm. long joins the two sacs; the duct is 2.1 cm. long.

TANGANYIKA. S.W. Kilimanjaro, slopes above Marangu, 8,000 ft., March 1957, leg. Virginia Orr in Acad. Nat. Sci. Philad. 226935.

A further lot of specimens collected at Arusha by D. C. Thomas belongs to the same circle of affinity. According to the collector the shell can be voluntarily exposed.

The body is a unicolorous bistre with a pale bistre sole. The mantle is very rugose but the surface smooth. The pulmonary aperture is 2.4 cm. from the anterior margin of the mantle and the pallial slit is small but distinct. The body is 8.5 cm. long and 1.5 cm. wide; the mantle 4.4 cm. long. The shell is oval with a fine membranous margin, the nucleus situated above the posterior margin; concentrically striate and with interrupted radial striae, 11 mm. long and 8 mm. wide. The dart sac is short, bulbous at the base and obliquely truncate at the apex, 1.6 cm. long, 8 mm. wide at the base and 4.5 mm. wide at the apex. The spermatheca is narrowly spindle-shaped, 1.2 cm. long, narrowed at the extreme apex; the duct is very narrowed before it joins the sac and is 1.4 cm. long. A younger specimen had a straighter dart sac 1.2 cm. long and an undeveloped spermatheca 3 mm. long and 1 mm. wide on a duct 1 cm. long. The darts in the mature specimen numbered about 16 and are straight, glabrous, white with the pointed end brownish, about 1 cm. long.

The radula is 9 mm. long and about 4.2 mm wide; there are about 100 teeth in each row on either side of the central tooth including 20 laterals and 6–7 transitionals. The main marginals have narrow entire cusps  $10.5\ \mu$  wide. The outermost 2–4 marginals are short and have 2–3 cusplets on the outer edge of the cusp; the next 15 have a cusplet on the outer edge of the cusp about 18–21  $\mu$  from the tip. The bases of the teeth are fimbriated posteriorly. Viewed with the naked eye the radula is distinctly divided into three longitudinal areas. The jaw mounted was horseshoe-shaped (not natural?) 2.5 mm. wide and 2.5 mm. long. Figs. 30–31.

A further large lot of specimens collected in banana plantations near Arusha, near the main Arusha–Moshi road, by W. Carmichael were unfortunately not preserved and arrived in a rotting condition. They are ochraceous with pale whitish-grey neck and flanks. The largest had a shell 14 mm. long and 9 mm. wide. The dart sac is very similar in shape to the last lot but much bigger, about

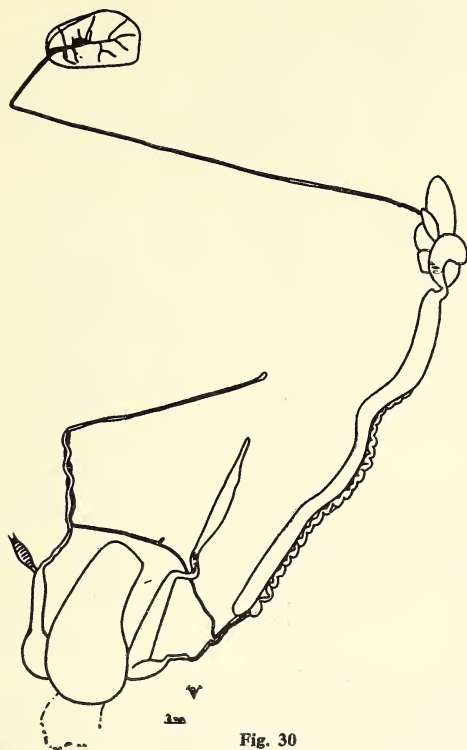


Fig. 30

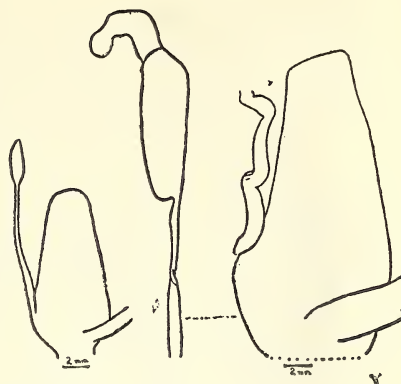


Fig. 31



Fig. 32

2.4 cm. long and varying considerably in the width of the obliquely truncate apex. The spermatheca is a sausage-shaped sac with a narrower terminal portion, together 1.6 cm. long; the duct is 1.9–2.4 cm. long, narrowing at the apex. This lot is merely more adult than the last lot but I think identical. Fig. 32.

An ochre-coloured slug 5.5 cm. long with the mantle 2.3 cm. long; a strongly keeled back and the pulmonary aperture 8.5 mm. from the posterior margin was collected at Rongai, Kilimanjaro. The genitalia were undeveloped but those of a juvenile belonging to this group of forms.

***T. copleyi reticulatum* Verdcourt subsp. nov.**

A cream-coloured slug completely covered with a pale buff-brown open reticulated pattern. The reticulate pattern was constant in this lot. I have never seen any pattern on the typical Nairobi subspecies. Also there appear to be fewer darts. The mantle is sinuate behind, reticulate but smooth between the reticulation; the grooves on the hind body are deep. The pulmonary aperture is 2 cm. from the posterior margin of the mantle; the pallial slit is narrow, 3.5 mm. long. The animal is 8–9 cm. long and 2.9 cm. wide; the mantle is 4.2 cm. long and the hind body is 4.5 cm. long. The sole areas measure  $3.5 + 2 + 3.5$  mm. wide respectively. The shell is oval, convex, yellowish-brown with a white nucleus, concentrically striate and with radial striae, 10.5 mm. long and 7.3 mm. wide. The dart sac is cylindrical, swollen in the lower third, narrowed to the subtruncate apex. There are about ten darts 1.6–1.7 cm. long and 0.2 mm. in diameter, curved, finely and sharply pointed at the apex, incrassate at the base, 0.5 mm. in diameter there, surface with scaly ridges so that edges appear hairy. Spermatheca ovoid, obpyriform or elongate with a drawn-out apex, 6–10 mm. long and 3–4 mm. wide, duct 1.6 cm. long, narrowed above.

The radula is 8 mm. long and 4.5 mm. wide; there are about 108 teeth in each row on either side of the central tooth including 25 laterals and about seven transitionals. The long narrow entire cusps on the main marginals are 9–12  $\mu$  wide. The outermost eight or so marginals are short and irregular with 2–3 cusplets on the outside of the main cusps; the next 25–30 have a cusplet on the outer edge of the cusp about 18–24  $\mu$  from the tip in the inner marginals but so low on the outer ones that the cusps are bifid. The tooth bases are fimbriated. The jaw is 4.3 mm. wide. Fig. 33 (Page 24).

KENYA. Ruiru, 15 miles north of Nairobi, Coffee Research Centre, a large number of specimens



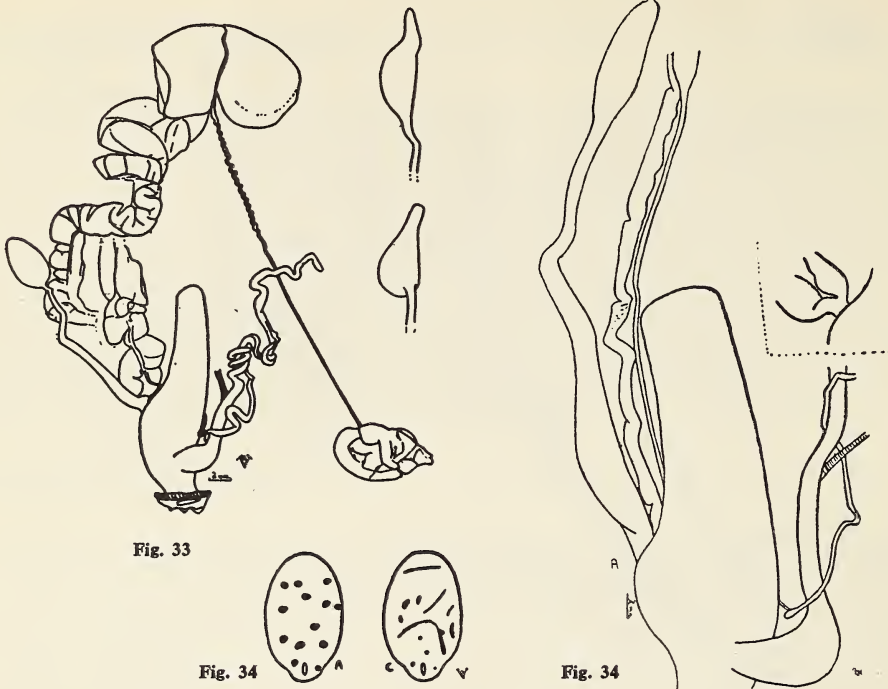


Fig. 33

Fig. 34

Fig. 34

damaging coffee pulp, leg. D. J. McCrae (holotype in Coryndon Memorial Museum). I have had many reports of similar slugs being found in thousands in coffee plantations at Thika and nearby some 10–20 miles north of the present locality.

***T. copleyi kulalense* Verdcourt subsp. nov.**

On Mt. Kulal in the Northern Frontier Province of Kenya I found members of the subgenus *Polytoxon* to be very common. On examination they would appear to belong to one exceedingly variable form. The slugs varied in colour from entirely creamy-ochraceous with no trace of spotting through grey-ochraceous with varying amounts of blackish markings (from small spots to an entire reticulate black pattern) to entirely blackish-grey with darker spots. In all the specimens the head and tentacles are blackish. A range of individuals are described below. This race differs from the typical one in its great variation in colour, the larger dart sac in fully grown individuals and the greater number of darts.

**Specimen A**

Animal buff with small round blackish-brown spots about 2.5 mm. in diameter, some with a blackish haze around them. Head dark and tentacles greyish-black. Back keeled save just behind the mantle, sparsely spotted on flanks but unspotted on areas below the mantle. The mantle is sinuate at the posterior margin, obscurely polygonally reticulate, sparsely spotted (12 scattered spots). The animal is about 12 cm. long and 2.5 cm. tall; the hind body is 6 cm. long and the mantle 4.1 cm. long and 2.3 cm. wide. The sole areas measure 5, 5 and 6 mm. wide respectively. The anterior centimetre of the mantle is free. The pallial aperture is small and the pulmonary aperture is 2.2 cm. from the anterior margin. The shell is oval-orbicular, 11 mm. long and 9 mm. wide; the nucleus is very close to the posterior margin; the sculpture consists of concentric striae and interrupted radial striae. The genitalia are figured in Fig. 34. The dart sac is robust and cylindrical, squarely truncate at the apex. The spermatheca is sausage-shaped on a long duct which is thick basally but much narrowed above. The albumen gland is narrowly tongue-shaped, 14 mm. long and 3 mm. wide. The common duct is 9 cm. long and the free oviduct 3.5 cm. long. The coiled part of the epiphallus is 4.5 cm. long and the lime gland very long, 5.3 cm.

**Specimen B**

Animal ochraceous, unspotted; tentacles dark greyish. The hind body is keeled at the rear but the keel becomes evanescent behind the mantle. Preserved in spirit the keel appears paler than the rest

of the back. The mantle is sinuate posteriorly, very shallowly polygonally reticulate. The pallial slit is 2 mm. long and 1 mm. wide; the pulmonary aperture is situated 1.3 cm. from the posterior margin. The animal is 5.7 cm. long, 1.3 cm. wide and 1.5 cm. tall; the hind body measures 2.5 cm. and the mantle 2.3 cm. The sole areas are 3.25, 3.5 and 3.25 mm. respectively. The shell is oval-orbicular, 8.3 mm. long and 6.2 mm. wide, membranous and tinged greenish-horn at the edges; the nucleus is situated on the posterior margin and the sculpture consists of concentric and radial striae. The genitalia were found to be immature.

#### Specimen C

Ochraceous with brownish, wavy lines containing dark spots and also scattered odd spots of brown. The hind body has two vague stripes of marks on either side and the mantle has lines and spots (as in Fig. 34). The hind body is very strongly keeled throughout its length, the keel marked at intervals with dark marks. The mantle is shallowly polygonally reticulate, broadly rounded in front and sinuate behind. The pallial slit is small and the pulmonary orifice is situated 1.3 cm. from the anterior margin. The animal is 7.5 cm. long, 1.6 cm. wide and 2.1 cm. tall; the hind body is 4.1 cm. long and the mantle 3.7 cm. long. The sole areas measure 5.5, 4 and 5.5 mm. in width. The genitalia are not fully developed. The dart sac is the same shape as in A but only 9 mm. long; the sac contains many sharply pointed darts 6.5–7.5 mm. long. They appear rough at the edges due to the overlapping of crystals and are not really hairy. The spermatheca together with its duct are 2.1 cm. long, the sac quite undeveloped. The lime gland is 1.4 cm. long.

#### Specimen D

This specimen obviously belongs to the same pattern form as A. The animal is ochraceous with numerous small round darkish brown spots on the sides of the hind body and below the mantle; the mantle itself is, however, almost unspotted. The hind body is sharply keeled posteriorly; the mantle is sinuate at the back; the pallial slit is small and the pulmonary orifice is situated 12.5 mm. from the posterior margin of the mantle. The animal is 7 cm. long; the hind body is 3.6 cm. long and the mantle 2.7 cm. long. The genitalia are undeveloped.

#### Specimen E

Animal ochraceous, entirely unspotted; tentacles dark blackish-grey. The keel is noticeable only at the rear of the hind body. The mantle is sinuate posteriorly and is very shallowly polygonally reticulate; the anterior centimetre is free; pallial slit 2.2 mm. long and pulmonary aperture 1.8 cm. from the posterior margin. The animal is 7.5 cm. long, 2.2 cm. wide and 2.2 cm. tall; the mantle is 3.5 cm. long. The shell is oval, 11.5 mm. long and 8 mm. wide; the nucleus is situated near the posterior margin and is filled with callus beneath; the shell is horn-coloured save for the white nucleus; the sculpture consists of concentric and radial striae. The genitalia were found to be undeveloped, the dart sac being only 9 mm. long.

#### Specimen F

Animal ochraceous, tentacles blackish; hind body with the keel marked throughout, particularly posteriorly and least so just behind the mantle, keel darker than the rest of the hind body; flanks with two to three faint spots on either side. Mantle paler, unspotted, broadly subtruncate anteriorly and free for 1 cm., sinuate posteriorly; pulmonary orifice 1.4 cm. from the posterior margin, pallial slit 1.5 mm. long. The animal is 6.9 cm. long, 1.4 cm. wide and 1.65 cm. tall; the mantle is 2.9 cm. long and the hind body 3.7 cm. long. The sole areas are 3.5, 3 and 3.6 mm. wide respectively. The genitalia were found to be completely undeveloped.

#### Specimen G

Animal ochraceous with dark tentacles, much marked with dark blackish-brown dots and curved stripes. Another specimen was seen with a broad brown reticulation over the whole animal, the ochraceous parts being reduced in extent to about 50 per cent. The hind body is keeled posteriorly. The mantle is free in front for about 1.2 cm., very slightly sinuate behind, shallowly polygonally reticulate. The pallial slit is 1.7 mm. long; the pulmonary orifice is situated 1.8 cm. from the posterior margin. The animal is 8.1 cm. long, 2.1 cm. wide and 2.6 cm. tall; the mantle is 3.8 cm. long. The sole areas are 6.7, 4 and 6.7 mm. wide respectively, the central area the darkest. The shell is oval, pale horn-coloured, 11.5 mm. long and 7.8 mm. wide; the smooth nucleus is situated 0.75 mm. from the posterior margin; the sculpture consists of concentric and radial striae. The dart sac is 2.8 cm. long, obliquely truncate at the apex which is 5 mm. wide. There are 25 slender darts, 2.35–2.6 cm. long, with long, very slender, triangular points about 2.5 mm. long. The darts are about 0.2–0.3 mm. in diameter but vary considerably. The margins are rough or even quite serrate due to the overlapping of crystals. The blunter end of the dart is subacute with the margins crenulate or rippled. This effect gives the appearance of being due to differential solution. Just behind the slender pointed end the dart is narrowed and often bent at an angle. The lime gland is 4.5 cm. long. The spermatheca is elongate, 7 mm. long and 2.2 mm. wide with an apical portion 4 mm. long and 1 mm. wide. The radula is 10.5 mm.



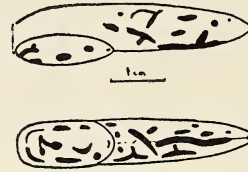
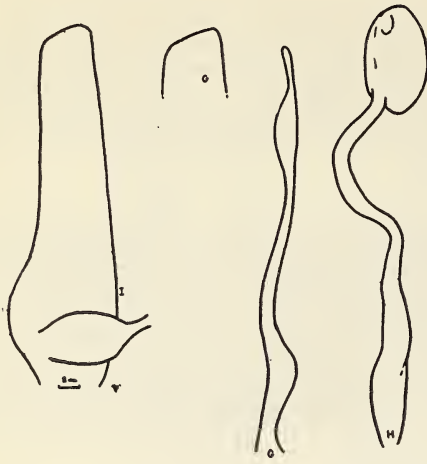


Fig. 36A

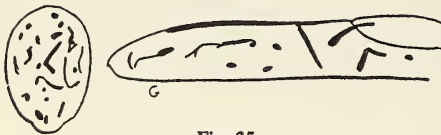


Fig. 35

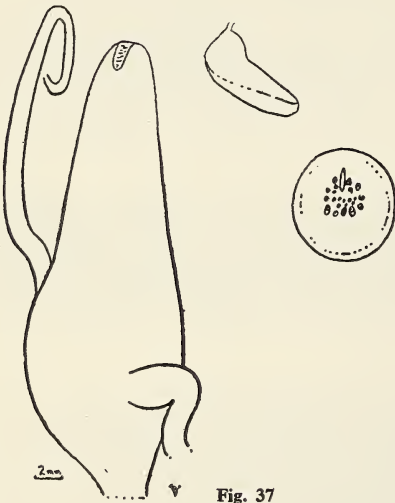


Fig. 37

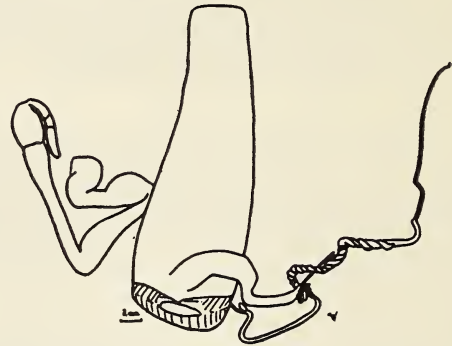


Fig. 36B

long and 5.5 mm. wide; there are about 121 teeth in each row on either side of the central tooth including 26 laterals and about nine transitionals. The main marginals have narrow entire cusps 12–15  $\mu$  wide. The 14 outermost marginals are irregular and the next 20 have wide cusps with a cusplet on the outer margin of varying prominence 9–12  $\mu$  from the tip. Jaw with pointed ends, 7 mm. wide. Fig. 35.

#### Specimen H

Animal entirely blackish-grey with no spots; mouth area and neck paler, tentacles dark; outer sole areas grey, striate, inner area paler. Hind body keeled throughout, darker than the sides. Mantle

polygonally reticulate, rather sinuate behind, front 9 mm. free, pallial hole 1.5 mm. long. The animal is 7.5 cm. long, 1.5 cm. wide and 1.8 cm. tall; the hind body is 3.9 cm. long and the mantle 3.1 cm. long. The pulmonary orifice is 1.6 cm. from the posterior margin. The sole areas are 4.75, 4 and 4.75 mm. wide respectively. The genitalia were found to be very undeveloped but identical with the juvenile cream-coloured specimens and I believe this specimen is merely a dark form with black predominating. The shell is oval, 10.5 mm. long and 7.5 mm. wide, pale yellowish save for the white nucleus.

#### Specimen I

Animal very similar to the last but with dark spots on the hind body and mantle. Hind body keeled posteriorly. Mantle sinuate behind, very rounded and broad in front, the first 1.2 cm. free, pulmonary orifice 1.9 cm. from the posterior margin. Animal about 8.5 cm. long, 1.9 cm. wide and 2.3 cm. tall; hind body 4.2 cm. long (5.2 cm. measured along the dorsum); mantle 4.2 cm. long. Sole areas 4.4, 4.7 and 4.4 mm. wide respectively, outer areas striate. Shell very thin and broken, membranous (due to solution?), oval-orbicular, 12.5 mm. long and 10 mm. wide. Dart sac very large, 3.4 cm. long, obliquely truncate and 5 mm. wide at the apex and 1 cm. wide above the base. The darts are curved and roughened in the way mentioned previously, about 2.7 cm. long. The spermatheca is swollen and ovoid  $10 \times 6$  mm. and the duct is 3.5 cm. long. The lime gland is 7.2 cm. long. The albumen gland is 2.4 cm. long and 7.5 mm. wide. Fig. 35.

#### Specimen J

A further specimen was collected very similar to the last but with fewer spots. The animal has the hind body strongly keeled and a total length of 7.5 cm. Dart sac quite undeveloped, only 7 mm. long but containing small darts.

Specimen I is chosen as holotype of the race and all the others are designated paratypes (material is in the Coryndon Memorial Museum).

#### *T. copleyi moloense* Verdcourt subsp. nov.

Slug with distinctive pattern of pale and dark pigments. An immature specimen is very pale creamy-grey, almost white, with striking purple-brown markings on the mantle and body as shown in Fig. 36A, sole whitish. Hind body keeled throughout but only prominent behind. Mantle 1.8 cm. long and 0.85 cm. wide, and dorsum 2.6 cm. long. Adult very pale cream-buff with a superimposed pattern of dark purple-brown on the mantle and the hind body but lacking on the flanks below the mantle; the posterior end of the animal is entirely dark; further forward the black pattern cuts off variously shaped pale areas as shown in Fig. 36. Pulmonary aperture 1.4 cm. from the anterior margin; pallial slit oval, 4.5 mm. long. The sole is blue-grey. Mantle 3.1 cm. long and 2.4 cm. wide, rather transversely grooved 1 cm. from the anterior margin. Dorsum 4 cm. long, head 1.4 cm. long. Shell broadly oval, rather flat, much less convex than usual, nucleus above extreme posterior edge, concentrically ridged, 11 mm. long and 9 mm. wide. The dart sac is robust, slightly curved, truncate at the apex, widened below, about 3 cm. long. There are 18 long, slender, scaly-textured darts. The male organs were not fully developed. The parts not shown in Fig. 36B measure as follows: albumen gland 3.8 cm. long and 1.55 cm. wide, ovoid with a drawn-out portion apically, pointed below; hermaphrodite gland  $10.5 \times 6.5$  mm., hermaphrodite duct 5.5 cm. long, common duct 8.8 cm. long. The spermatheca is merely a dilation of the duct with a very narrow apical portion, the basal part of the duct is swollen and kinked.

The radula is 8.2 mm. long and 4.8 mm. wide; there are about 97 teeth in each row on either side of the central tooth including 24 laterals and seven transitionals. The cusps of the marginal teeth are narrow, 9–12  $\mu$  wide. The outermost 12 or so marginals are irregular; the next 15 have a distinct cusplet on the outer margin of the cusp some 20–30  $\mu$  from its tip. Some of the marginals also have a slight bump on the inside edge of the cusp. The jaw is about 5 mm. wide. Fig. 36.

KENYA. Molo, leg. W. Wilkinson (holotype in Coryndon Memorial Museum). This species shows some similarity to *T. pardus* Pilsbry which is figured as having a very different dart sac but I have previously mentioned that this might not be fully developed; the pattern, however, is very different, not that that carries much weight in slugs, which are notoriously variable in this respect. The present form does, however, have over four times as many darts. It may not be distinct from the last subsp. but the spermatheca appears very different.

#### *T. kilimanjaricum* Verdcourt sp. nov.

Some specimens collected on the S.E. side of Kilimanjaro by C. F. Hemming differ in several respects from *T. copleyi maranguense* but may be more developed specimens; they are certainly much larger than those mentioned above. I believe they represent a distinct species. The dart sac is not truncate and quite differently shaped. The marginal teeth of the radula also have much wider cusps.



The darts also appear to be more numerous than they are in *T. copleyi copleyi* and *T. copleyi marangouense*.

Body unicolorous, grey-buff. Back strongly keeled; mantle obscurely shagreened, pulmonary aperture about 2.2 cm. from the anterior edge of the mantle. Pallial slit small. In life the slugs are about 15 cm. long but spirit measurements are as follows: body 9.2 cm. long, dorsum 4.5 cm. long, mantle 3.8 cm. long. Shell amber, broadly ovate with a conspicuously eccentric, small white nucleus, about 0.5 mm. from the posterior edge, 11 mm. long and 9.5 mm. wide. The dart sac is more massive than in the last species, nearly 3.5 cm. long and not truncate at the apex, but rounded and slightly grooved, swollen below. The spermatheca is sausage-shaped but was distorted and flattened in the specimen examined. The duct is long and narrowed above, see Fig. 37. There are about 20-22 darts occupying the central part of the thick muscular sac; they are slightly curved, fine, smooth and sharply pointed, about 2.4 cm. long and 0.2 mm. in diameter. The radula is 9.8 mm. long and 5 mm. wide; there are about 84 teeth in each row on either side of the central tooth, including 29 laterals and transitionals. The cusp of the main marginals is rather broader than in *T. copleyi* being 16.5  $\mu$  broad and bears a trace of an *inner* cusplet about 12  $\mu$  from the tip. The outermost 20-23 marginals are small and rather irregular with variously shaped more or less bifid cusps. Viewed with the naked eye the radula shows no signs of being divided into longitudinal areas.

TANGANYIKA. S.E. slopes of Kilimanjaro, leg. C. F. Hemming (holotype and paratypes in Coryndon Memorial Museum).

*T. volkensii* Simroth is depicted as having a very similarly shaped dart sac but, in the drawing, the spermatheca is shown as being equal to the duct and not much shorter as in the present form.

*T. volkensii* Simroth in Abh. Senck. naturf. Ges. 19, 293, t.1, f.21-22 and t.2, f.10 (sphalm 19 in text) and t.f.4-5 (1896)

Animal 3.1-6.1 cm. long, unicolorous leather-coloured but a small specimen was yellow-buff with darker stripes and spots in a line on the hind body and a narrow grey stripe on each side of the mantle; the hind body is also covered with loam-coloured flecks. Dart sac elongate, broadest at the base, smoothly rounded to a very obtuse apex; many setose darts. Spermatheca ovoid-elongate, drawn out at the apex, recurved, abruptly passing into a duct scarcely longer than the sac.

TANGANYIKA. No locality was given, leg. Fischer. Heynemann (1906) says probably "Kwa Katsch" which I have not been able to trace.\* The specimens also cannot be found. Although it is possible that this might be a member of the complex I have called *T. copleyi* and would thus be the earliest name, there is too little evidence. If nothing turns up to match the name it may have to be dropped. The juvenile colouration has not been noted in any unicolorous races of *T. copleyi*.

[*T. ruwenzoriense* Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 297, t.f.151, pl. 8, f.8 (1919)

Mantle and posterior half of the foot olive, sides below the mantle creamy shading into olive, lateral areas of the sole olive, central area buffy-citrine. Mantle reticulate feebly near the borders, pallial pore small and slit-like, pulmonary orifice 19 mm. from the front edge of the mantle; dorsum acutely carinate, the keel dividing just behind the mantle. Animal 6.5 cm. long and 1.2 cm. wide at the sole, mantle 3 cm. long. Shell 9  $\times$  7.7 mm. Dart sac 2.5 cm. long, cylindrical, swollen at the base, obliquely truncate at the apex. Spermatheca fusiform, narrowed at the apex, bluntly apiculate, constricted in the middle; the duct may be either longer or shorter than the sac—the figure is obscure on this point. The combined length is 2.6 cm. There are seven cylindrical, needle-shaped, pilose darts 1.8 cm. long—presumably there are usually four pairs. Pilsbry states that his new species must closely resemble *T. roccatii* but that species has an obtusely keeled tail, two villose darts and a much smaller spermatheca which might, however, not have been functional in the specimen figured by Pollonera.

BELGIAN CONGO. Ruwenzori, Lanuri Valley, leg. J. Bequaert.]

[*T. pardus* Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 299, t.f.152, pl. 8, f.10 (1919)

A buffy-brown to olive-brown slug spotted with black on the flanks; the mantle marked with larger irregular spots, many of them roughly horse-shoe-shaped. Side areas of the sole greyish-olive, central area buffy-brown. Mantle with very shallow polygonal reticulation; back acutely keeled throughout. Pallial slit small. Pulmonary orifice 1.4 cm. from the front edge of the mantle. Animal 5.7 cm. long, sole 1 cm. wide and mantle 2.5 cm. long. The dart sac is ovoid, short and blunt, 7 mm. long; there are four darts about 5 mm. long, quite smooth. No flagellum was visible in Pilsbry's specimen. The spermatheca is tubular and continuous with the duct but undoubtedly undeveloped. Pilsbry says that externally this resembles Simroth's figure of *T. neumanni* but I can find no figure

\* J. Gillett (Kew) believes this locality may be at the eastern end of the Kavirondo Gulf in an area now called Nyakach, i.e. in Kenya.

showing the animal of that species in Simroth's paper. Pilsbry also states that the maculation is probably a character of no significance and that the short, broad dart sac, smooth darts, long penial retractor muscle and absence of a flagellum are more important characters. Judging by my experience with *T. thikense*, I think it highly likely that the dart sac is undeveloped and that it might be of quite a different shape in a bigger specimen.

BELGIAN CONGO. Ruwenzori, Butagu Valley, leg. J. Bequaert].

Simroth also mentions two undescribed species as follows.

*T. sp.* Simroth in Abh. Senck. naturf. Ges. **19**, 295 (1896)

TANGANYIKA? Kwa Katsch, leg. Neumann.

*T. sp.* Simroth in S.B. naturf. Ges. Lpz. (1895-6), 151 (1897)

TANGANYIKA. Kilimanjaro, Marangu, leg. Kretzschmer (Berlin Museum).

*T. sp.*

A pure white slug about 8.5 cm. long; back somewhat keeled, particularly at rear; mantle rugulose, pulmonary aperture 1.9 cm. from the posterior margin, pallial aperture 1.5 mm. long. Mantle 4 cm. long, dorsum 4.2 cm. long, body 1.9 cm. wide. The sole regions are 6.7 + 3.5 + 6.7 mm. respectively. The shell is oval, 10.5 mm. long and 8.5 mm. wide, concentrically ridged. Although the animal is large the genitalia are apparently undeveloped. The dart sac is oblong, narrowed above to the truncate apex, about 1.2 cm. long. The spermatheca is narrow, about 4 mm. long, barely differentiated from the duct which is 9 mm. long. Fig. 38.

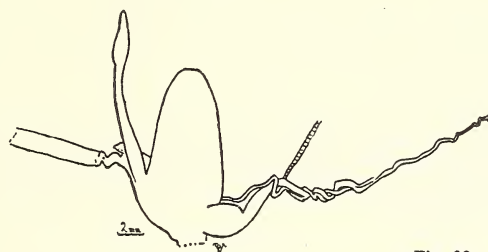


Fig. 38

TANGANYIKA. Ngorongoro Crater, in forest in crater rim, leg. L. D. Verdcourt.

*T. neumanni* Simroth was described from the same general area but as I have pointed out the structure of the genitalia may be quite different from subg. *Polytoxon* and the colouration is quite different. The single specimen taken probably represents a new species.

*T. sp.*

Slug 7.5 cm. long, 1.2 cm. wide and 2.1 cm. high (in spirit), grey, fringe pale with dark lines; middle of sole pale, sides grey; mantle dark grey-black. Head granulate, the raised areas less than 1 mm. across; body scarcely keeled; well marked lines from the mantle region meet the foot at a low angle or run into the caudal region. Body truncate, still 10 mm. high only a few mm. from the tip; caudal horn very short, 2 × 6 mm., caudal pore in notch below. Mantle 3.2 cm. long, bluntly rounded behind, pulmonary aperture 1.8 cm. from anterior end, pallial pore in median line a few mm. from the distal point. Mantle scarcely granulate (on a second specimen granules are apparent, 1-2 mm. across). Sole with median band 3 mm. wide at widest point, gradually narrowed posteriorly. Caudal gland well developed. Although the animal is large the genitalia are quite undeveloped. The atrium-dart sac is cylindrical, abruptly truncate, small, 11 mm. long, 3 mm. wide at maximum width where penis enters; the proximal 4 mm. is thin-walled, tapering to the aperture. The combined spermatheca-oviduct enters a little behind the penis. Spermatheca indistinct from the duct, the whole 11 mm. long. Penis c. 5 mm. long; epiphallus 8 mm. long; lime gland 3 mm. long, angled near tip; flagellum c. 0.5 mm. long. Common spermatheca-oviduct less than 1 mm. long, oviduct 18-20 mm. long; albumen gland 5 × 2.5 mm., bluntly triangular; hermaphrodite gland ovoid, 6 × 4 mm.; duct 24 mm. long.

KENYA. Saboti, Kaporetwa, near Kitale, in T. H. E. Jackson's garden, leg. B. Verdcourt.

Sexually too immature to identify, or to be worth drawing. Further material of this is needed. It is probably only a form of *T. copleyi*.



Subgenus *Spirotoxon* Simroth in S.B. naturf. Ges. Lpz. (1895-6), 149 (1897). (N.B.—Proposed as a subgenus on page 149 and used as a genus on 152.) I follow Pilsbry (1919) in considering it a subgenus. Subgenotype, *T. elegans* (Simroth)

Oviduct entering the dart sac at the middle of base. Dart sac containing one spiral dart.

### Key to the species

Mantle brown; keel brown with darker stripe below it; spermathecal duct 3-4 times as long as the sac	<i>T. elegans</i>
Mantle dark brown with blue edges and one dark stripe on either side; keel pale brown margined with black	<i>T. stuhlmanni</i>
Mantle blue-violet with buff-brown sides; hind body blue-violet with blue spots; spermathecal duct eight times as long as the sac	<i>T. simrothi</i>

#### *T. elegans* (Simroth)

*S. elegans* Simroth in S.B. naturf. Ges. Lpz. (1895-6), 152 (1897) and in Zool. Jahrb., Abt. Syst. 19, 702, t.39, f.27, t.40, f.51-55 (1904)

Slug about 10 cm. long, mantle brown, reticulated and keel of similar colour; a very dark stripe on the body below the keel stripe. Flanks bluish or lilac, tinged with pale reddish-brown and also with dark oblique interrupted lines. Dart sac elongate, widest near the base and narrowed towards the apex but with a knob at the extreme apex. Spermatheca depressed-globose, considerably broader than long with a duct 3-4 times as long. Dart 1.34 cm. long and 0.07 cm. thick near the base.

TANGANYIKA. Near Dundee, Kingani River, leg. Stuhlmann (Berlin Museum).

Bacci (1951) in his Check List of Somaliland and Ethiopian molluscs puts this locality in Somalia where Stuhlmann never collected.

#### *T. stuhlmanni* (Simroth)

*Spirotoxon stuhlmanni* Simroth in Zool. Jahrb., Abt. Syst. 19, 703-4, t.39, f.28 (1904)

This is presumably the *S. sp.* mentioned by Simroth in S.B. naturf. Ges. Lpz. (1895-6), 152 (1897)

Slug 5.3 cm. long. Mantle dark brown with blue edges and one dark stripe on either side. Back with pale brown keel margined with black, flanks blue with black and brown oblique stripes below. Sole very pale. Genitalia immature.

TANGANYIKA. Without further data, leg. Stuhlmann (Berlin Museum).

#### [*T. simrothi* Verdcourt nom. nov.]

*Spirotoxon neumanni* Simroth in Zool. Jahrb., Abt. Syst. 19, 704, t.39, f.26 and t.40, f.33-50 (1904)

A slug 4.6 cm. long, mantle blue-violet with buff-brown sides; shell nucleus creamy white. Body white below the mantle, hind body and flanks blue-violet with buff tinge above the fringe and with blue spots extending all over the sides. Spermatheca globose with the duct about eight times as long as the sac. Dart sac elongate, broadest near the middle, attenuated to a blunt apex. The locality is "probably Doko" but I have not traced this and Bacci also did not know it when he wrote his check list. It is possibly in Ethiopia. The specimen was collected by Neumann.]

Subgenus *Atrichotoxon* (Simroth). Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 295 (1919)

*Atrichotoxon* Simroth in Reise in Ostafrika A. Voeltzkow 1903-5, Wiss. Ergebn. 2, 605 (1910)

This group is defined as being very similar to *Trichotoxon* sensu stricto but without darts. The oviduct enters the combined atrium and dart sac near the apex. Dart sac with retractors in typical species.

Subgenotype, *T. punctatum* (Simroth)

### Key to the species

Dart sac sub-cylindrical, tapering, not equipped with retractor muscles; slug purple-brown with no markings	<i>T. usambarense</i>
Dart sac narrow, swollen distally and with retractors at the proximal cylindrical end; slug grey-brown, sides with thin, dark oblique lines and scattered brown flecks, mantle with flecks and dark stripes	<i>T. punctatum</i>
Dart sac ovoid-conic, without retractor muscles; slug grey with dark brown lateral and median bands, mantle fawn with olive-brown reticulate markings	<i>T. sp.</i>

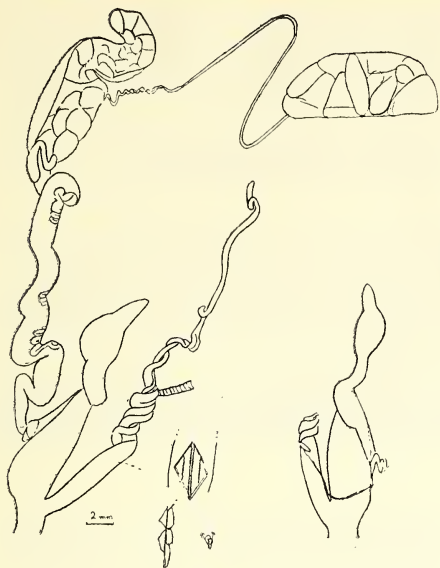


Fig. 39

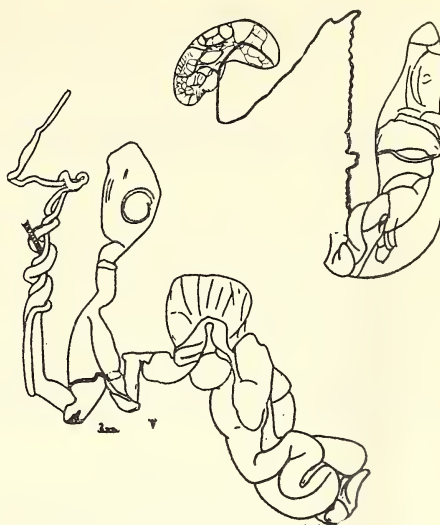


Fig. 40

***T. punctatum* (Simroth)**

*Atrichotoxon punctatum* Simroth in Reise in Ostafrika A. Voeltzkow (1903–5), Wiss. Ergebn. 2, 606, t.f13, t.20, f.6 (1910)

A grey-brown slug 5 cm. long. Mantle with flecks and dark stripes; sides with thin, dark, oblique lines and scattered brown flecks all over. The dart sac is depicted as a narrow elongate organ swollen at one end and cylindrical at the other with retractors at the cylindrical basal end. The figures do not show any of the other organs.

EAST AFRICA. Without further data, leg. Stuhlmann.

***T. usambarense* Verdcourt sp. nov.**

A purple-brown slug devoid of markings; hind body not keeled except at the extreme end where a blunt keel is apparent. Mantle granular, pulmonary aperture 1.5 cm. from the anterior margin. Pallial aperture small. Mantle 2.7 cm. long; dorsum 8.5 cm. long and 1.3 cm. wide; sole areas  $3.5 + 1.5 + 3.5$  mm. respectively. Shell thin, suborbicular, 6 mm. long and 5 mm. wide. Dart sac tapering cylindrical, about 1 cm. long, containing no darts but ridged internally, the ridges being made up of small separate flaps. Spermatheca ovoid with narrow apical portion and short duct; the oviduct is adnate to the dart sac. The general structure of the genitalia is shown in Figs. 39 and 40.

This species does not match the description of the sole described species in the subgenus *Atrichotoxon*. Although the description of *T. punctatum* Simroth does not adequately show what the genitalia are like, it differs from the present species in several characteristics. The dart sac is shown as a long narrow organ swollen distally and with retractors at the proximal cylindrical end. The slug is also differently coloured and marked with stripes and flecks.

TANGANYIKA. East Usambaras, Amani, leg. B. Verdcourt.

A second specimen was entirely purple save for the grey sole. The mantle is finely granular and the hind body is not keeled; the pulmonary aperture is 1.45 cm. behind the anterior margin. The total length is 5.8 cm. and the breadth 1.8 cm.; the slug is 1.8 cm. high at the mantle; the mantle is 2.45 cm. long. The sole areas measure  $5 + 3.5 + 5$  mm. respectively. The pallial aperture is small. The shell is oval, thick with callus inside, olive-brown with a white nucleus, concentrically ridged and with some striae at right angles, 7.5 mm. long and 6 mm. wide. The dart sac is rather more robust than in the first specimen; the spermatheca is ovoid, 10 mm. long and 6 mm. wide. See Fig. 40.

TANGANYIKA. East Usambaras, Amani, Mt. Bomole, leg. B. Verdcourt (holotype in Coryndon Memorial Museum).

***T. sp. ? nov.***

Slug, 4–5 cm. long, white in forepart of body, slightly pink below tentacles, rest of body iron-grey with a dark band down either side and a median band (actual ridge is light coloured). Mantle fawn to



off-white, with olive-green-brown reticulate markings above. The lateral dark bands extend along the mantle. The fringe is white with close, parallel, fine vertical striations; foot white below. The reproductive system is shown in Fig. 41. The atrium-dart sac when opened was found to contain many small splinter-like crystals in the convolutions which seem to be arranged radially and not facing down the cavity like darts.

KENYA. Bura Hills, near Voi, Vuria Peak, 7,250 ft., common in damp forest litter, 17th April, 1960, leg. Verdcourt and Polhill 32 (the material has been sent to Dr. Urban for description).

Two specimens which are generically indeterminate do not appear to match any other specimens seen.

An entirely white slug with very few scattered black spots on the mantle and hind body and also some inconspicuous yellow-brown ones. Body scarcely keeled behind. Pallial hole imperceptible. Central area of the sole very pale stone colour and darker than the sides. Body 5.2 cm. long and 9.5 mm. wide, sole 4 mm. wide, mantle 1.9 cm. long. Genitalia quite undeveloped and genus indeterminate.

TANGANYIKA. Lindi District, mile 23 on the road to Songea, among fallen leaves in cashew nut plantation, leg. W. Wilkinson.

A pale grey slug with grey markings on the mantle only, an inverted V mark around the pallial slit, some stripes at the side and spots, etc., anteriorly. The hind body is keeled. The pulmonary orifice is 7 mm. from the anterior margin. The total length is 3.2 cm.; the dorsum is 1.5 cm. long and the mantle 1.4 cm. long.

KENYA. Nairobi, leg. J. G. Williams.

The following description of a small slug found in the East Usambaras is added for completeness. I have not been able to decide about its position so have left it undescribed. Despite its slug-like external appearance it appears not to belong to the Urocyclidae but to a new group of the Helicarionidae.

#### *Genus et species nov.*

Animal small, colourless, more or less granular-tuberculate all over, tinged greenish or pinkish in life. Hind body with a slight keel, hollowed out just behind the mantle. Pulmonary aperture 4 mm. from the posterior margin, well behind the middle of the mantle. The pallial aperture not visible. The body is 2.6 cm. long and 0.5 cm. tall, the sole is 2.5 mm. wide and the central area 0.75 mm. wide; the mantle is 1.2 cm. long, sinuate behind. The shell is oval, white, the nucleus on the posterior margin, 2.2 mm. long and 1.2 mm. wide. The last 7 mm. of the foot are solid and there is

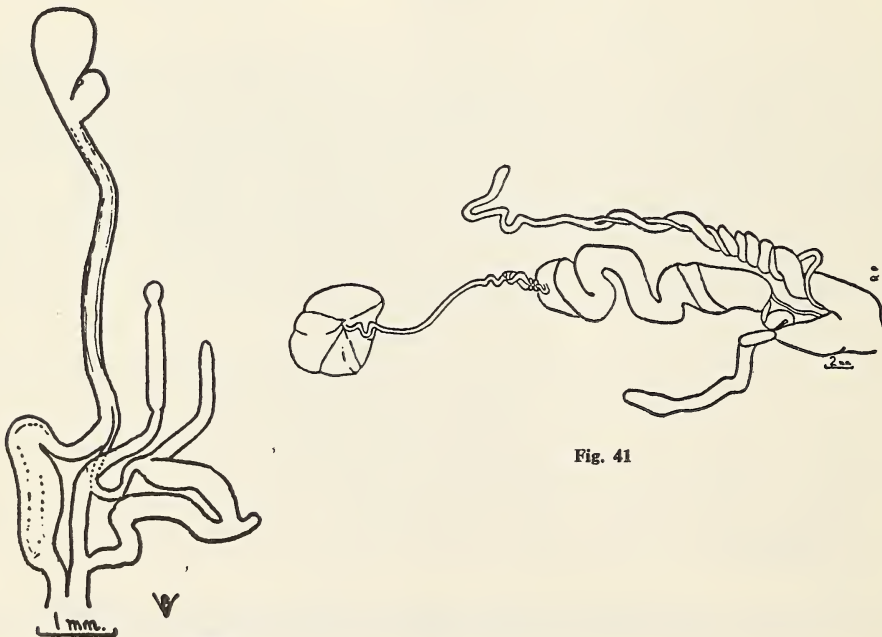


Fig. 41

Fig. 42

a distinct caudal gland over which the hind body projects considerably. The genitalia were possibly not fully developed. They show much similarity to those of *Leptichnus*. The flagellum is relatively very long—1.8 mm. The spermatheca is fusiform but perhaps undeveloped. The radula exhibits many interesting features. There are a very large number of exceedingly minute teeth in angular rows. The formula is about  $360 : 1 : 360 \times 235$ . All the teeth appear to be three-cusped but the structure of the outermost marginals is very difficult to see even under an oil immersion lens. Fig. 42.

This mollusc does not belong to the family Urocyclidae judging by this radula but to an isolated subfamily of the Helicarionidae near to the Durgellinae. The material has been handed over to Dr. Urban for study.

TANGANYIKA. East Usambaras, Sigi, leg. B. Verdcourt.

Apart from the two specimens of the above form a third was collected with them which differs in having markings. The animal is similarly granular, the hind body more or less keeled at the back. The mantle is reticulated with grey and also has odd spots and some white tubercles; the keel is pale but the upper parts of the hind body below the keel have reticulated grey markings. The body is 2.3 cm. long and 6.5 mm. tall, the mantle is 1.2 cm. long with the pulmonary aperture 6.2 mm. from the posterior margin. The sole is 3 mm. wide, each area being 1 mm. wide. The hind body is similarly much hollowed behind the mantle and the foot is solid for the last 10 mm. This specimen is undoubtedly related to the last but the genitalia were immature and tenuously thin and could not be interpreted.

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#### Abbreviations used in figures

a.g.	=	albumen gland	h.d.	=	hermaphrodite duct
d.s.	=	dart sac	p.	=	penis
ep.	=	epiphallus	r.	=	penial retractor
fl.	=	flagellum (lime gland in Fig. 3)	sp.	=	spermatheca
h.g.	=	hermaphrodite gland			

These abbreviations have been used only in some of the figures. The parts should easily be made out by reference to these. I must confess to a certain amount of non-uniformity in the names I have used for the flagella and confusion will also be found in the works of other authors. The lower one, i.e. nearest the penis apex as one moves along the epiphallus (usually longer) is usually called the lime gland and the upper one (often white and calcareous and seemingly better called a lime gland; usually short but not always) is called *the* flagellum. On p. 205 under *Atoxon kiboense* the reference to upper flagellum should read lower flagellum, i.e. lime gland.

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## LIST OF SLUGS DESCRIBED FROM EAST AFRICA

This list covers species described from Kenya, Uganda, Tanganyika and the various islands. Species occurring just over the borders (e.g. on the Congo side of the Ruwenzories) are enclosed in brackets. The generic order is based on that used by Thiele (1931). Where one of the species mentioned is also the genotype of its respective genus it has been marked with a G.

### *Leptichnus* Simroth, 1896

1. *L. fischeri* Simroth, 1896 G.
2. *L. sp. nov.*

### *Phaneroporus* Simroth, 1889

3. *P. reinhardti* Simroth, 1889 G.
4. *P. unicolor* Simroth, 1894

### *Atoxon* Simroth, 1889

5. *A. robustum* Simroth, 1897  
[*A. pallens* Simroth, 1897]
6. *A. martensi* Simroth, 1910  
[*A. brunneum* Simroth, 1897]  
[*A. flavum* Simroth, 1897]
7. *A. lineatum* Simroth, 1897
8. *A. sp. near lineatum* Simroth
9. *A. kiboense* Verdcourt, 1960
10. *A. taeniatum* Simroth, 1897
11. *A. ornatum* Pollon., 1906
12. *A. auriantiacum* Simroth, 1897
13. *A. cavallii* Pollon., 1906
14. *A. variegatum* Simroth, 1897
15. *A. carli* Simroth, 1912
16. *A. fuelleborni* Simroth, 1910
17. *A. sp.*

### *Dendrolimax* Heynemann, 1868

- [*D. osborni* Pilsbry, 1919]
18. *D. leprosus* Pollon., 1906
19. *D. sp.*

### *Bukobia* Simroth, 1897

- [*B. cockerelli* Pilsbry, 1919]
20. *B. picta* Simroth, 1897 G.
21. *B. hoesemanni* Simroth, 1910
22. *B. kikuyuensis* Urban and Verdcourt, 1960
23. *B. signata* (Pollon., 1906)
24. *B. modesta* (Pollon., 1906)
25. *B. incerta* (Pollon., 1906)

*Urocyclus* Gray, 1864Subgenus *Urocyclus* s.s.

26. *U. rufescens* Simroth, 1894
  27. *U. variabilis* Verdcourt, 1960
  28. *U. bussei* Simroth, 1910
  29. *U. ehlersii* Simroth, 1905
  30. *U. roebucki* Simroth, 1910
- Subgenus *Mesocyclus* Pollon., 1906
31. *U. zonatus* Pollon., 1906
  32. *U. tenuizonatus* Pollon., 1906
  33. *U. subfasciatus* Pollon., 1906
  34. *U. raripunctatus* Pollon., 1906

*Trichotoxon* Simroth, 1889Subgenus *Trichotoxon* s.s.

35. *T. heyneimanni* Simroth, 1889 G.
  36. *T. conradti* Simroth, 1894
  37. *T. voeltzkowi* Simroth, 1910
  38. *T. maculatum* Simroth, 1897
  39. *T. prestoni* Pollon., 1911
  40. *T. kempfi* Pollon., 1911
  41. *T. keniense* Pollon., 1911
  42. *T. thikense* Verdcourt, 1951
  - 43a. *T. nyambenense nyambenense* Verdcourt and Polhill sp. nov.
  - 43b. *T. nyambenense violaceum* Verdcourt and Polhill subsp. nov.
  44. *T. bambuseti* Verdcourt and Polhill sp. nov.
  45. *T. sp. nov.?*  
[*T. pollonerae* Pilsbry, 1919]
  46. *T. martensi* (Heyneimann) ex Simroth, 1882
  47. *T. sp.*
  48. *T. sp.*
  49. *T. robustum* Simroth, 1896
- Subgenus *Polytoxoxon* Simroth, 1897
50. *T. neumanni* Simroth, 1896
  51. *T. athrix* Simroth, 1896
  52. *T. auriantiacum* Simroth, 1897
  53. *T. roccatii* Pollon., 1906
  - 54a. *T. copleyi copleyi* Verdcourt sp. nov.
  - 54b. *T. copleyi maranguense* Verdcourt subsp. nov.
  - 54c. *T. copleyi reticulatum* Verdcourt subsp. nov.
  - 54d. *T. copleyi kulalense* Verdcourt subsp. nov.
  - 54e. *T. copleyi moloense* Verdcourt subsp. nov.
  55. *T. kilimanjaricum* Verdcourt sp. nov.
  56. *T. volkensii* Simroth, 1896  
[*T. ruwenzoriense* Pilsbry, 1919]  
[*T. pardus* Pilsbry, 1919]
  57. *T. sp.*
  58. *T. sp.*
- Subgenus *Spirotoxoxon* Simroth, 1897
59. *T. elegans* Simroth, 1897
  60. *T. stuhlmanni* Simroth, 1904  
[*T. simrothi* Verdcourt, nom. nov.]
- Subgenus *Atrichotoxon* Simroth, 1897



- 61. *T. punctatum* Simroth, 1910
- 62. *T. usambarens* Verdcourt, sp. nov.
- 63. *T.* sp.

Genus novum incertae sedis

- 64. sp. nov.

### CAPTIONS

- Fig. 25. *Trichotoxon (Polytoxon) copleyi copleyi* sp. nov. Kenya, Nairobi, H. Copley. Genitalia of holotype.
- Fig. 26. *Trichotoxon (Polytoxon) copleyi copleyi* sp. nov. Kenya, Dagoretti, near Nairobi, P. R. Hesse. Genitalia.
- Fig. 27. *Trichotoxon (Polytoxon) copleyi copleyi* sp. nov. Kenya, Nairobi, Westlands, R. Polhill. Genitalia.
- Fig. 28. *Trichotoxon (Polytoxon) copleyi ?copleyi* Kenya, Isuria Escarpment, C. W. P. Harries. Genitalia.
- Fig. 29. *Trichotoxon (Polytoxon) copleyi maranguense* subsp. nov. Tanganyika, Kilimanjaro, Marangu, B. Verdcourt. Genitalia of paratype and dart sac and spermatheca of holotype.
- Fig. 30. *Trichotoxon (Polytoxon) copleyi maranguense* subsp. nov. Tanganyika, Arusha, D. C. Thomas. Genitalia.
- Fig. 31. *Trichotoxon (Polytoxon) copleyi maranguense* subsp. nov. Tanganyika, Arusha, D. C. Thomas. Dart sac and spermatheca of another specimen.
- Fig. 32. *Trichotoxon (Polytoxon) copleyi maranguense* subsp. nov. Tanganyika, Arusha, Carmichael. Dart sac and spermatheca.
- Fig. 33. *Trichotoxon (Polytoxon) copleyi reticulatum* subsp. nov. Kenya, Ruiru, Coffee Research Station, D. J. McCrae. Genitalia of holotype.
- Fig. 34. *Trichotoxon (Polytoxon) copleyi kulalense* subsp. nov. Kenya, N.F.P., Mt. Kulal, B. Verdcourt. Mantle patterns of slugs A and C and part of genitalia of slug A.
- Fig. 35. *Trichotoxon (Polytoxon) copleyi kulalense* subsp. nov. Kenya, N.F.P., Mt. Kulal, B. Verdcourt. Parts of dart sacs and spermathecae of slugs I and G and pattern diagram of slug G.
- Fig. 36. *Trichotoxon (Polytoxon) copleyi moloense* subsp. nov. Kenya, Molo, W. Wilkinson. Pattern diagram and part of genitalia of holotype.
- Fig. 37. *Trichotoxon (Polytoxon) kilimanjaricum* sp. nov. S.E. Kilimanjaro, C. F. Hemming. Part of genitalia of holotype.
- Fig. 38. *Trichotoxon (Polytoxon)* sp. Tanganyika, Ngorongoro Crater, L. D. Verdcourt. Genitalia.
- Fig. 39. *Trichotoxon (Atrichotoxon) usambarens* sp. nov. Tanganyika, East Usambaras, Amani, B. Verdcourt. Genitalia.
- Fig. 40. *Trichotoxon (Atrichotoxon) usambarens* sp. nov. Tanganyika, East Usambaras, Mt. Bomole, near Amani, B. Verdcourt. Genitalia of holotype.
- Fig. 41. *Trichotoxon (Atrichotoxon)* sp. Kenya, Bura Hills, Vuria Peak, B. Verdcourt and R. Polhill 32. Genitalia.
- Fig. 42. Slug of unknown affinities—gen. nov.? Tanganyika, East Usambaras, Sigi below Amani, B. Verdcourt. Genitalia.





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